NIST Special Publication 305—Supplement 25

Publications of the National Institute of Standards and Technology 1993 Catalog

U.S. Department of Commerce
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National Institute of Standards and Technology

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- Reactor Radiation

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- Building Materials
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- Fire Safety
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- Systems and Software Technology
- Computer Security
- Systems and Network Architecture
- Advanced Systems

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- Applied and Computational Mathematics[2]
- Statistical Engineering[2]
- Scientific Computing Environments[2]
- Computer Services
- Computer Systems and Communications[2]
- Information Systems

[1] At Boulder, CO 80303.
[2] Some elements at Boulder, CO 80303.

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Publications of the National Institute of Standards and Technology 1993 Catalog

Debby King, Editor

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CONTENTS

CATALOG STRUCTURE AND USE

Full bibliographic citations including keywords and abstracts for National Institute of Standards and Technology (NIST) papers published and entered into the National Technical Information Service (NTIS) collection are cited in the "NIST Publications Announcements" section of this catalog. (Also included are papers published prior to 1993 but not reported in previous supplements of this annual catalog.) Entries are arranged by NTIS subject classifications which consist of 34 broad subject categories (see back cover) and over 350 subcategories. Within a subcategory, entries are listed alphanumerically by NTIS order number.

Four indexes are included to allow the user to identify papers by personal author, keywords, title, and NTIS order/report number. Each entry lists the appropriate title, the NTIS order number, and the abstract number.

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Papers noted "Not Available NTIS" may be obtained directly from the author or from the external publisher cited. Such papers are not for sale by either the GPO or NTIS.

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NIST PUBLICATIONS ANNOUNCEMENTS

SAMPLE ENTRY

COMPUTERS, CONTROL & INFORMATION THEORY

NTIS Subject Category

Computer Software

NTIS Subcategory

00,261

Abstract Number

PB93-189835 PC **A03**/MF **A01**

NTIS order number Availability **Price Codes**

National Inst. of Standards and Technology (CSL), Gaithersburg, MD.

Corporate or performing organization

Building Hadamard Matrices in Steps of 4 to Order 200.

Report Title

N. Drouin. Apr 93, 22p

Personal authors Report date Page count

NISTIR-5121

Report Number

Contract or grant number

Keywords: Computer program verification, Systems analysis, Sensitivity, Experimental design, *SPT (Synthetic Perturbation Tuning), *Hadamard matrices, Fractional factorial design.

Keywords: * indicates keyword index entry

Based on methods of construction described in 1978, the programs described allow one to build Hadamard matrices of order up to 200, in steps of 4. These matrices are to be used to generate statistical plans of analysis for the 'Synthetic Perturbation Tuning' technique of program sensitivity analysis.

Abstract

ADMINISTRATION & MANAGEMENT

Research Program Administration & Technology Transfer

00,001

PB94-107430 PC E02/MF A01

Executive Office of the President, Washington, DC.

Technology for Economic Growth: President's Progress Report.

Nov 93, 74p.

See also AD-A261 553.

Keywords: *Economic growth, *Technology innovation, *Research projects, International trade, Research and development, Bilateral agreements, Multilateral agreements, Job opportunities, Global positioning system, Federal agencies, Electric hybrid vehicles, Industrial development, Investments, Technology transfer, Dual use, Defense conversion.

Contents: Executive Summary; Technology for Economic Growth: Checklist of Clinton Administration Key Accomplishments; Putting Technology to Work for America's Future; Technology and Trade: Competing in a Global Economy; Moving Manufacturing Technologies to the Global Marketplace; Realizing the Opportunities of the Information Age; Defense Technology: The Payoffs for Economic and Military Security; Energy and Environment: New Technologies for Growth; and Transportation and the Economy.

00,002

PB94-119435 PC A06/MF A02

National Inst. of Standards and Technology, Gaithersburg, MD. Public Affairs Div.

Guide to NIST.

Special pub.

Oct 93, 119p, NIST/SP-858.

Keywords: *Manuals, *Research management, *Laboratories, *Standardization, Measurements, Product development, Research, Test facilities, *NIST(National Institute of Standards and Technology), Technology services.

The guide is designed to make finding out about programs and contacts at the National Institute of Standards and Technology a little easier. NIST researchers actively seek out industrial and other collaborators to work on well-defined, cooperative research projects of mutual interest. In addition, NIST researchers collaborate informally with industrial and academic researchers to solve shorter-term technical problems. The guide describes more than 250 NIST research projects, grants and industry outreach programs, services, and facilities, followed by contact names, phone numbers, and mail and electronic mail (Internet) addresses for further information.

AERONAUTICS & AERODYNAMICS

Aerodynamics

00,003

PB93-153245 Not available NTIS

Aerodynamics

National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Structures Div.
Chaotic Motions of Forced and Coupled Galloping Oscillators.
Final rept.
G. R. Cook, and E. Simiu. 1990, 12p.
Pub. in Jnl. of Wind Engineering and Industrial Aerodynamics 36, p1083-1094 1990.

Keywords: *Oscillating flow, *Oscillators, *Wind effects, *Chaos, Nonlinear systems, Numerical analysis, Flow distortion, Oscillations, Fluidelasticity, Reprints, Galloping oscillators.

Numerical simulations of the behavior of a periodically forced square galloping oscillator yielded results showing that the behavior of this system has similarities with the behavior of the circle map. Lock-in regions were found to be ordered as rational numbers obtained by the Farey construction. At the transition from quasiperiodic to chaotic motion corresponding to a winding number equal to the golden mean, the fractal dimension of the critical line was found to be 0.864, that is, to within 0.5% of the theoretical value for the circle map. Numerical studies were also performed on an autonomous system consisting of two elastically coupled galloping oscillators. Preliminary tests conducted in the 0.3 m diameter water tunnel of the David Taylor Research Center and in the CBT wind tunnel demonstrated the feasibility of the experimental study of both the forced oscillator and the autonomous coupled oscillators described in the paper.

Aeronautics

00,004
PB94-103660 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Fire Safety Engineering Div.
Dispersion of Fire Suppression Agents Discharged from High Pressure Vessels: Establishing Initial/Boundary Conditions for the Flow Outside the Vessel.
L. Y. Cooper. Sep 93, 38p, NISTIR-5219.
Sponsored by Department of the Air Force, Wright-Patterson AFB, OH.

Keywords: *Aircraft fires, *Fire extinguishers, *Boundary conditions, *Orifice flow, Two phase flow, Fire extinguishing agents, Mathematical models, Enthalpy, Pressure vessels, Dispersing, Jet flow, Thermodynamic properties, Velocity distribution, Fire protection.

The work reports on part of an effort to study the dispersion and extinguishment effectiveness of Halon and Halon-alternative fire extinguishment agents discharged from N2-pressurized vessels. In the systems under consideration, as the agent exits from the vessel, thermodynamic and fluid-dynamic instabilities lead to flashing and break-up of the agent into a two-phase droplet/gaseous jet mixture. This occurs in a transition region relatively close to the vessel exit orifice/nozzle. Downstream of this region the two-phase agent jet then mixes with the ambient air environment and is dispersed in the protected space. A mathematical model has been developed previously to simulate the time-dependent discharge of the agent from the pressure vessel. Using the output of this model and thermodynamic and fluid-dynamic considerations of the phenomena in the transition section, the present work develops a method for determining a set of initial/boundary conditions at an initial section of the jet, downstream of the transition region. These initial/boundary conditions are in a form that can be used to formulate and solve the problem of the development and dispersal of the ensuing mixed air/two-phase-agent jet. Example applications of the developed methodology are presented. These are for agent discharge from a half-liter cylindrical discharge vessel with a circular discharge nozzle/orifice of diameter 0.019m. Simulations involve discharge of the vessel when it is half-filled with either Freon 22 or Halon 1301 and then pressurized with N2 to 41.37x10(exp 5)Pa (600psi).

Aircraft

00,005
AD-A261 270/3 PC A07/MF A02
National Inst. of Standards and Technology, Gaithersburg, MD.
Model Study of the Aircraft Cabin Environment Resulting From In-Flight Fires.
Final rept.
B. J. McCaffrey, K. M. Tu, W. J. Rinkinen, and T. I. Eklund. Nov 92, 126p, DOT/FAA/CT-90/22.

Keywords: *Simulation, *Ventilation, *Aircraft cabins, *Fire Fighting, Flight, Hatches, Heat transfer, Propane, Scale models, Temperature, Test and evaluation, Air flow, Fire safety, Temperature gradients, Aircraft seats, *Aircraft fires, Counterflow, Gas concentration profile, Ventilation flow direction.

A series of tests were conducted to examine the effect of the ventilation on the environment in an aircraft passenger cabin during an in-flight fire. These tests were run in a reduced scale mockup of an aircraft passenger cabin. A propane burner operating at 10 or 30 kilowatts served as the fire source. The simulated seats and the cabin lining material were both noncombustible. The vertical temperature and gas concentration profiles in the cabin were measured as a function of time. Reversing the normal ventilation flow direction by introducing the forced air at the floor level and exhausting it at the ceiling significantly reduced the measured temperatures and gas concentrations. Opening two 152- by 305-millimeter hatches in the end walls at the ceiling level to the outside air resulted in a significant reduction in the measured gas concentrations.

00,006
AD-A263 148/9 PC A04/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Modeling the Heat Release Rate of Aircraft Cabin Panels.
Final rept.
W. J. Parker, and R. Filipczak. Feb 93, 53p, DOT/FAA/CT-92/3.

Keywords: *Aircraft cabins, *Panels, Calorimeters, Chemicals, Computers, Constants, Functions, Heat of combustion, Kinetics, Mass, Models, Ohio, Rates, Release, Temperature, Time, *Heat transmission.

A computer model was developed to calculate the heat release rate of aircraft cabin composite panels based on the panel's thermophysical, chemical, and geometric properties. The model calculates the temperature through the panel as a function of time and uses this along with measured kinetic constants to deduce mass loss rate which is multiplied by the heat of combustion of the volatiles. The calculated results are in general agreement with the measured heat release obtained from the Ohio State University (OSU) calorimeter.... Heat Release Rate, Calorimeter, Fire.

00,007
N94-10779/4 (Order as N94-10766/1, PC A16/MF A03)
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Computer-Aided Molecular Design of Fire Resistant Aircraft Materials.
M. R. Nyden, and J. E. Brown. Mar 93, 12p.
In FAA, Proceedings of the International Conference for the Promotion of Advanced Fire Resistant Aircraft Interior Materials p 147-158.

Keywords: *Aircraft construction materials, *Computer aided design, *Flame retardants, Computerized simulation, Flame calorimeters, Honeycomb structures, Commercial aircraft, Flammability, Heat treatment, Irradiation, Nonflammable materials, *Aircraft fires.

Molecular dynamic simulations and Cone Calorimeter measurements were used to assess the effects of electron beam irradiation and heat treatments on the flammability of the honeycomb composites used in the sidewalls, ceilings, and stowage bins of commercial aircraft. The irradiation of this material did not result in any measureable changes. A dramatic reduction in the peak rate of heat release, however, was observed in samples that had been heated overnight at 250 C.

00,008
N94-10781/0 (Order as N94-10766/1, PC A16/MF A03)
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Non-Halogenated, Flame Retarded Polycarbonate.
T. Kashiwagi, T. G. Cleary, G. C. Davis, and J. H. Lupinski. Mar 93, 13p.
In FAA, Proceedings of the International Conference for the Promotion of Advanced Fire Resistant Aircraft Interior Materials p 175-189. Sponsored by Ge.

Keywords: *Aircraft construction materials, *Flame retardants, *Flammability, *Nonflammable materials, *Polycarbonates, *Siloxanes, Charring, Combustion products, Flame calorimeters, Flame propagation, Heat transfer, *Aircraft fires.

Various flammability properties of a siloxane-containing bisphenol-A polycarbonate sample, with the siloxane as an additive or as a copolymer, were measured and compared with those of a pure polycarbonate sample. The results show that the peak heat release rate for the siloxane-containing polycarbonate sample is significantly reduced (less than half) compared to that for the pure polycarbonate sample with two different sizes of sample, 10cm x 10cm and 40cm x 40cm. However, the ignition delay time for the siloxane-containing sample is shorter than that for the pure polycarbonate sample. Also, the flame spread rate under an external radiant flux becomes faster for the siloxane-containing sample than that for the pure polycarbonate sample. The observed char behavior, such as char depth, physical nature and apparent combustibility, and its impact on flammability properties are discussed.

00,009
N94-10787/7 (Order as N94-10766/1, PC A16/MF A03)
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Developments Needed to Expand the Role of Fire Modeling in Material Fire Hazard Assessment.
A. J. Fowell. Mar 93, 8p.
In FAA, Proceedings of the International Conference for the Promotion of Advanced Fire Resistant Aircraft Interior Materials p 255-262.

Keywords: *Aircraft construction materials, *Aircraft hazards, *Fire prevention, *Flammability, *Mathematical models, Aircraft compartments, Flame propagation, Heat transfer, *Aircraft fires.

To assess the fire hazards associated with aircraft interior materials, prediction of how the materials perform under different fire scenarios is needed. This requires information on a variety of fire characteristics including thermal inertia, ease of ignition, rate of heat release, flame spread, products of combustion, and the response to suppressants. Exposure conditions such as location, orientation, ventilation, and proximity to other materials can influence some of those characteristics. Pass/fail test methods of the past cannot provide the information to assure fire safety under a variety of circumstances. Fire modeling in combination with new bench scale material flammability test methods can meet the need. National and international developments in model validation, documentation, and acceptance are presented. The transition to aircraft cabin fire hazard assessment using fire models requires a data base on material fire properties. The case is made for greater use of improved bench scale test methods which can provide data suitable for use in the fire models.

ASTRONOMY & ASTROPHYSICS

Astronomy & Celestial Mechanics

00,010
PB93-145761 PC A03/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Applied and Computational Mathematics Div.

Mechanism for Capture into Resonance.
T. J. Burns, and C. K. R. T. Jones. Jan 93, 34p, NISTIR-5104.

Keywords: *Celestial mechanics, *Resonance, Dynamical systems, Hamiltonian functions, Perturbation theory, Capture, Average, Theorems.

We present a mechanism for capture into resonance in perturbed two-frequency Hamiltonian systems. When an isolated attractor of the averaged system passes through a resonance on a time scale which is asymptotically slower than that on which the damping works, it transfers its domain of attraction to the resonance.

Astrophysics

00,011
PB93-149003 Not available NTIS
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Molecular Physics Div.
Recommended Rest Frequencies for Observed Interstellar Molecular Microwave Transitions. 1991 Revision.
F. J. Lovas. c1992, 91p.
Included in Jnl. of Physical and Chemical Reference Data, v21 n2 p181-272 Mar/Apr 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Molecular clouds, *Stellar envelopes, *Microwave spectra, Rotational spectra, Transition radiation, Hyperfine structure, Interstellar matter, Radio astronomy, Tables(Data).

Critically evaluated transition frequencies for the molecular transitions detected in interstellar and circumstellar clouds are presented. The tabulated transitions are recommended for reference in future astronomical observations in the microwave and millimeter wavelength regions. The transition frequencies have been selected from the literature. The information tabulated includes the species identity, transition frequency, uncertainty, and quantum state labels. In addition, representative line antenna temperatures are listed for a typical astronomical source for each transition as a convenience to users, and the references are cited for the laboratory and astronomical literature which have been employed.

ATMOSPHERIC SCIENCES

Aeronomy

00,012
PB93-198422 PC A10/MF A03
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Atomic Physics Div.
International Colloqium on Atomic Spectra and Oscillator Strengths for Astrophysical and Laboratory Plasmas (4th). Held at the National Institute of Standards and Technology, Gaithersburg, Maryland on September 14-17, 1992.
Special pub.
J. Sugar, and D. Leckrone. Apr 93, 201p, NIST/SP-850.
Also available from Supt. of Docs as SN003-003-03210-7. Prepared in cooperation with National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.

Keywords: *Atomic spectroscopy, *Meetings, *Astrophysics, *Plasmas(Physics), Oscillators, Laboratory equipment, Aerospace environments.

This was the fourth in a series of colloquia begun at the University of Lund, Sweden in 1983 and subsequently held in Toledo, Ohio and Amsterdam, The Netherlands. The purpose of these meetings is to provide an international forum for communication between major users of atomic spectroscopic data and the providers of these data. These data include atomic wavelengths, line shapes, energy levels, lifetimes, and oscillator strengths. Speakers were selected from a wide variety of disciplines including astrophysics, laboratory plasma research, spectrochemistry, and theoretical and experimental atomic physics.

Physical Meteorology

00,013
PB93-149136 Not available NTIS
American Chemical Society, Washington, DC.
Journal of Physical and Chemical Reference Data, Volume 21, No. 6, November/December 1992.
Bimonthly rept.
D. R. Lide. c1992, 471p.
See also PB93-149144 and PB93-149094. Prepared in cooperation with American Inst. of Physics, New York. Sponsored by National Inst. of Standards and Technology, Gaithersburg, MD.
Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Physical properties, *Chemical properties, *Physical chemistry, Atmospheric chemistry, Photochemical reaction, Reaction kinetics, Vapor phases, Tables(Data), Thermochemistry, Indexes(Documentation), *Reference materials.

Contents: Evaluated Kinetic and Photochemical Data for Atmospheric Chemistry. Supplement IV. IUPAC Subcommittee on Gas Kinetic Data Evaluation for Atmospheric Chemistry.

00,014
PB93-149144 Not available NTIS
California Univ., Riverside.
Evaluated Kinetic and Photochemical Data for Atmospheric Chemistry. Supplement 4. IUPAC Subcommittee on Gas Kinetic Data Evaluation for Atmospheric Chemistry.
R. Atkinson, D. L. Baulch, R. A. Cox, J. Troe, R. F. Hampson, and J. A. Kerr. c1992, 443p.
Prepared in cooperation with Leeds Univ. (England), Natural Environment Research Council, Swindon (England), National Inst. of Standards and Technology, Gaithersburg, MD., Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschultz, Duebendorf (Switzerland).
Included in Jnl. of Physical and Chemical Reference Data, v21 n6 p1125-1568 Nov/Dec 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Atmospheric chemistry, *Photochemistry, *Reaction kinetics, *Vapor phases, *Thermochemistry, Gases, Tables(Data), Enthalpy, Temperature.

The paper updates and extends previous critical evaluations of the kinetics and photochemistry of gas phase chemical reactions of neutral species involved in atmosphere chemistry. The work has been carried out by the authors under the auspices of the IUPAC Subcommittee on Gas Phase Kinetic Data Evaluation for Atmospheric Chemistry. Data sheets have been prepared for 489 thermal and photochemical reactions, containing summaries of the available experimental data with notes giving details of the experimental procedures. For each reaction, a preferred value of the rate coefficient at 298 K is given together with a temperature dependence where possible. The selection of the preferred value is discussed, and estimates of the accuracies of the rate coefficients and temperature coefficients have been made for each reaction. The data sheets are intended to provide the basic physical chemical data needed as input for calculations which model atmospheric chemistry. A table summarizing the preferred rate data is provided, together with an appendix listing the available data on enthalpies of formation of the reactant and product species.

BEHAVIOR & SOCIETY

Education, Law, & Humanities

00,015
PB93-213114 PC A09/MF A03
National Inst. of Standards and Technology, Gaithersburg, MD.
NIST Handbook 130, 1993. Uniform Laws and Regulations in the Areas of Legal Metrology and Motor Fuel Quality as Adopted by the 77th National Conference on Weights and Measures 1992.
J. A. Koenig. Oct 92, 196p.
Supersedes PB92-112416. Also available from Supt. of Docs.

Keywords: *Metrology, *Law(Jurisprudence), *Standards, *Fuel quality, Regulations, Weight measurement, Automotive fuels, Packaging, Marking, Commodity management, Food packaging.

The handbook, which is revised annually, compiles the uniform laws and regulations developed by the Committee on Laws and Regulations of the National Conference on Weights and Measures (NCWM). The compilation itself was approved by the NCWM in 1979, and this edition includes amendments adopted by the Conference at its annual meeting in 1992. The NCWM recommends adoption and promulgation by the States of these uniform laws and regulations as updated in the handbook.

BIOMEDICAL TECHNOLOGY & HUMAN FACTORS ENGINEERING

Biomedical Instrumentation & Bioengineering

00,016
PB93-125136 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Hydroxyapatite Cement. I. Basic Chemistry and Histologic Properties.
Final rept.
P. D. Costantino, C. D. Friedman, K. Jones, G. A. Sisson, L. C. Chow, and H. J. Pelzer. 1991, 6p.
Sponsored by American Dental Association Health Foundation, Chicago, IL.
Pub. in Archives of Otolaryngology-Head and Neck Surgery 117, p379-384 Apr 91.

Keywords: *Hydroxyapatites, *Bone cements, *Artificial implants, *Histology, Intraoperative period, Animals, Reprints.

Hydroxyapatite cement is a unique calcium phosphate preparation that can be shaped intraoperatively and sets in vivo to an implant composed of microporous hydroxyapatite. The histologic response to this cement was evaluated by implanting disks made of this material within the heads of nine cats. Three sets of 12 hydroxyapatite cement disks were produced containing 0%, 10%, and 20% macropores by volume, respectively. The disks were implanted subcutaneously, intramuscularly, above the periosteum of the skull, and directly onto the surface of the calvarium. Each macropore percentage was represented in each tissue plane, and animals were killed up to 9 months postoperatively. There were no toxic reactions, implants extruded, or wound infections. Histologic examination

of the implant-soft-tissue interfaces revealed a transient inflammatory response without foreign body reaction. The disks were resorbed over time in direct proportion to their macropore content (surface areas) in all groups except for those disks placed directly onto the surface of the calvarium below the periosteum.

00,017
PB93-150761 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Clinical Use of Beta-Quartz Glass-Ceramic Inserts.
Final rept.
F. C. Eichmiller. 1992, 5p.
Sponsored by American Dental Association Health Foundation, Chicago, IL.
Pub. in Compendium of Continuing Education in Dentistry XIII, n7 p568-576 1992.

Keywords: *Dental materials, *Ceramics, *Restoration, *Teeth, Composite materials, Reconstruction, Performance evaluation, Durability, Fillers, Reprints.

Efforts to improve composite dental materials have largely been centered around increasing the proportion of inorganic filler. Modern composites are still limited by high thermal expansion, high polymerization shrinkage, a low elastic modulus, and excessive wear. Tooth-colored alternatives to dental composites such as porcelains and indirect resin inlays are expensive, time consuming, and require excessive tooth reduction. Glass-ceramic inserts attempt to improve the overall properties of a composite filling by incorporating a large ceramic filler particle into the composite restoration, displacing as much of the composite resin as possible from the volume of the filling. The resulting restoration exhibits more of the superior properties of the glass-ceramic and is less influenced by the composite resin. The use of glass-ceramic inserts in composite fillings is a method of improving quality and durability at a low cost and without the need for specialized equipment or instrumentation.

00,018
PB93-150837 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Intrinsically Colored Microcrystalline Glass-Ceramic for Use in Dental Restoration.
Final rept.
L. A. George, F. C. Eichmiller, and R. L. Bowen. 1992, 4p.
See also PB93-129450. Sponsored by American Dental Association Health Foundation, Chicago, IL.
Pub. in American Ceramic Society Bulletin 71, n7 p1073-1076 Jul 92.

Keywords: *Dental materials, *Ceramics, *Crystals, *Restoration, *Teeth, Materials science, Colors(Materials), Reconstruction, Dentistry, Bacteria, Thermal properties, Physical properties, Chemical properties, Reprints.

Development of tooth-colored restorative materials that can be directly placed in tooth defects is currently one of the most difficult challenges in dental materials science. To be functional, dental materials must resist heavy cyclic loading, thermal shock, variable pH, chemical degradation, ultraviolet radiation, and bacterial invasion. Properties of thermal expansion, thermal conductivity, abrasion resistance, elastic modulus, and compressive and tensile strengths should be similar to natural tooth structure to begin to meet these demands. In addition, the restoration must be the natural color of the tooth to be aesthetically acceptable. The tooth-restoration interface must provide adequate mechanical and/or chemical adhesion to retain the restoration under load while providing a sealed barrier to bacteria and other unwanted substances. Metallic restorative materials have met most of the functional demands, but the development of esthetic tooth-colored materials has been limited by the properties required for these materials.

00,019
PB93-151298 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Infrared Spectroscopic Study of Cement Formation of Polymeric Calcium Phosphate Cement.
Final rept.
K. Miyazaki, Y. Akiyama, W. Motokawa, S. Takagi, L. C. Chow, T. Horibe, and J. M. Antonucci. 1992, 7p.
Sponsored by American Dental Association Health Foundation, Chicago, IL.
Pub. in Jnl. of the Japanese Society for Dental Materials and Devices 11, n2 p278-284 1992.

Keywords: *Dental materials, *Acid bonded reaction cements, *Infrared spectroscopy, *Polybasic organic acids, *Calcium phosphates, Cements, pH, Additives, Solutions, Setting time, Performance evaluation, Tartaric acid, Hydroxy acids, Reprints, Stannous fluoride.

We measured change in pH and in infrared spectra of reactants in dilute solution of polycarboxylic acid/calcium phosphate cement (PCA/CPC) in the presence and absence of tartaric acid and/or stannous fluoride (0.25-0.5g/10-20mlH2O) to investigate its setting reaction. Stannous fluoride inhibited the hardening of PCA/CPC cement and markedly delayed pH increase. Addition of tartaric acid induced no effect on pH curves. However, comparison of PCA/CPC cement containing tartaric acid and stannous fluoride with that containing only stannous fluoride revealed little evidence of the presence of unreacted carboxyl groups in the hardened cement. The increase in the pH curve observed during the first stage was related to the reaction between the tartaric acid and calcium ions in CPC. At pH values over 4, the production of the calcium salt of polyacrylic acid was confirmed. A correlation was observed between the absorbance change due to carboxylate formation and increase in pH.

00,020
PB93-151306 Not available NTIS
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Molecular Physics Div.
Chemical Change of Hardened PCA/CPC Cements in Various Storing Solutions.
Final rept.
K. Miyazaki, Y. Akiyama, W. Motokawa, S. Takagi, L. C. Chow, T. Horibe, and J. M. Antonucci. 1992, 7p.
Sponsored by American Dental Association Health Foundation, Chicago, IL.
Pub. in Jnl. of the Japanese Society for Dental Materials and Devices 11, n2 p324-330 1992.

Keywords: *Dental materials, *Acid bonded reaction cements, *Storage, *Chemical properties, *Polybasic organic acids, *Calcium phosphates, Cements, X-ray diffraction, Solutions, Tartaric acid, Additives, Inorganic phosphates, Coagulation, Reprints, Stannous fluoride, Apatite/fluoro, Apatite/hydroxy.

Hardened polycarboxylic acid/calcium phosphate cement (PCA/CPC) cement with and without tartaric acid and/or stannous fluoride was subjected to x-ray analysis after storage in three kinds of solutions (artificial saliva-like solution, phosphate buffer solution, and distilled water), and amount of calcium, phosphate and fluoride ions released into the storage solution was measured. In distilled water, calcium and phosphate ions were continuously released from not only the PCA/CPC cement with tartaric acid and stannous fluoride but also from the cement without these additives. However, in artificial saliva and phosphate buffer solutions, release ceased after about one month and uptake of both ions was detected. X-ray analysis revealed the formation of fluoroapatite and hydroxyapatite in the hardened cement containing tartaric acid and stannous fluoride when it had been stored in artificial saliva or distilled water. Conversely, in the cement without these additives, only minor amount of apatite formation was observed, even when it was stored in distilled water for 6 months. In addition, it was observed that fluoride ions were continuously released from the cement containing stannous fluoride for 6 months.

00,021
PB93-151777 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Synthesis and Evaluation of Novel Multifunctional Oligomers for Dentistry.
Final rept.
J. W. Stansbury. 1992, 4p.
Pub. in Jnl. of Dental Research 71, n3 p434-437 Mar 92.

Keywords: *Dental materials, *Polymerization, *Monomers, Comparison, Condensation reactions, Performance evaluation, Molecular structure, Chemical bonds, Mechanical properties, Phenols, Reprints, Ethoxylated bis-phenol A diacrylate, Ethoxylated bis-phenol A dimethacrylate.

A new type of multifunctional oligomer was synthesized, and its potential as a base monomer in dental composite formulations was evaluated. The oligomer of ethoxylated bis-phenol A diacrylate (OEBPA) was prepared in good yield by a formaldehyde insertion/condensation reaction. Although double bonds along the oligomer backbone are arranged in pairs such that cyclopolymerization is possible, it is not presently known whether this process plays a significant role in the polymerization. Indirect evidence supporting efficient cyclopolymerization involves the reduced polymerization shrinkage observed for polymerized OEBPA relative to polymers of other monomers used as base resins. Photo-cured composites containing either OEBPA, BIS-GMA, or ethoxylated bis-phenol A dimethacrylate (EBPADM) as base resin and TEGDMA as diluent were compared. This multifunction oligomer offers mechanical strength and conversion values that are comparable with those of existing base resin monomers while providing an approximate 30% reduction in polymerization shrinkage.

00,022
PB93-151801 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Residual Stress in a Porcelain-Metal Strip Related to Thermo-Physical Properties of Materials.
Final rept.
J. A. Tesk, and K. Asaoka. 1992, 5p.
Pub. in Residual Stresses - III, Science and Technology, v1 p146-150 1992.

Keywords: *Dental materials, *Thermophysical properties, *Residual stress, *Porcelain, *Metal strips, Computerized simulation, Fusion(Melting), Durability, Layers, Performance evaluation, Compressive properties, Reprints.

The durability of porcelain fused-to-metal (PFM) dental prostheses is thought to depend strongly on the levels of compressive stresses which can be generated in the porcelain outer surface layers. A computer simulation of the states of residual stress which are developed in PFM beams shows very complex interrelationships exist between properties such as the sharpness of the glass transition temperature range, coefficients of thermal expansion within that range and asymmetry of the beam. Potentially detrimental internal tensile stresses are shown capable of being developed. Due to the complex nature of the interactions, the simulations indicate that attempts to improve PFM systems based on qualitative reasoning may lead to disastrous results.

00,023
PB93-151835 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Effects of Magnesium and Fluoride on the Hydrolysis of Octacalcium Phosphate.
Final rept.
M. S. Tung, B. Tomazic, and W. E. Brown. 1992, 7p.
Sponsored by American Dental Association Health Foundation, Chicago, IL.
Pub. in Archives of Oral Biology 37, n7 p585-591 1992.

Keywords: *Dental materials, *Calcium phosphates, *Magnesium, *Fluorides, *Hydrolysis, *Acid bonded reaction cements, Adsorption, Reaction kinetics, Surface chemistry, Nucleation, Crystal growth, X-ray diffraction, Chemical analysis, pH, Reprints.

The adsorption of Mg ions on octacalcium phosphate (OCP) and its effect on OCP hydrolysis, with and without F, were studied. The Mg adsorption isotherm was fitted by the Langmuir model with an affinity constant of 0.74 ml/micromol and maximum number of sites, 31.19 micromol/g. The hydrolysis rates were measured in a pH stat by titration of base and were strongly temperature dependent. The products were examined by X-ray diffraction and chemical analysis. OCP hydrolysis takes place in two stages: the fast initial process, which is attributed to the surface topotactical conversion, followed by the main, slower process, which involves the nucleation and crystal growth. Mg ions, as 1 mmol/l MgCl2, prevented the initial surface reaction and decreased the nucleation rate dramatically and the growth rate slightly; F increased the rates of surface reaction and both the nucleation and crystal growth processes. The Ca/P ratio (1.53) and the line broadening in the X-ray diffraction patterns of the apatitic products were not significantly affected by the F. Mg also did not affect the Ca/P ratio and the line broadening at (002) diffraction, but decreased the line broadening at (310) diffraction.

Prosthetics & Mechanical Organs

00,024
PB93-198836 PC A06/MF A02
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Properties and Interactions of Oral Structures and Restorative Materials. Annual Report for Period October 1, 1991 to September 30, 1992.
Rept. for 1 Oct 91-30 Sep 92.
J. A. Tesk, J. M. Antonucci, J. W. Stansbury, J. Code, G. Schumacher, S. M. Keeny, and K. Asaoka. May 93, 118p, NISTIR-5175.
See also PB85-210409. Sponsored by National Inst. of Dental Research, Bethesda, MD.

Keywords: *Dental materials, *Permanent dental restoration, Biocompatible materials, Delivery of health care, Composite materials, Cements(Adhesives), Adhesives, Sealers, Alloys, Chemical analysis, Chromatography, X-ray diffraction, Nuclear magnetic resonance, Infrared spectroscopy.

The research program described is designed to achieve a number of objectives leading to improved dental restorative materials, techniques and applications of dental materials science for improved delivery of health care. The bulk of the research is related in one manner or another to dental composites, cements, adhesives, and sealants. Composite research focuses on improvements through the development of more durable resin matrices, stronger and more durable coupling between fillers and resins, and defining the best overall combination of components, including curing systems, for improved performance of composites. The work has moved swiftly toward a major emphasis on the synthesis and applications of monomers which reduce polymerization shrinkage through the use of expanding monomers (or monomers which undergo much less shrinkage than conventional resin-matrix monomers).

BUILDING INDUSTRY TECHNOLOGY

General

00,025
PB93-198869 PC A06/MF A02
National Fire Protection Association, Quincy, MA.
U.S. Fires in 'Board and Care' Homes Matrix Display of Selected Fatal Fires. Special Analysis.
J. R. Hall. Apr 93, 111p, NIST/GCR-93/627.
Grant 60NANB9D0974
Sponsored by National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.

Keywords: *Fires, *Residential buildings, Occurrence, Fatalities, Handicaps, Death, Investigations, Tables(Data), Nursing homes, Group homes, Halfway houses, Board and care homes.

The report presents available information on 57 fatal U.S. fires occurring during 1971 to 1992 and recorded in the National Fire Protection Association's (NFPA's) Fire Incident Data Organization (FIDO) as fires of technical interest in 'board and care' homes. It is an update of a report prepared in 1990 and adds nine incidents to that earlier study. It is part of a larger project on fire safety in board and care homes. The information has been organized into three tables. Included is information on: death tolls, construction details, code compliance, occupant behaviors, fire development, and building fire protection systems.

00,026
PB93-208460 PC A05/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD.
BLCC 4.0. The NIST 'Building Life-Cycle Cost' Program (Version 4.0). User's Guide and Reference Manual.
S. R. Petersen. May 93, 90p, NISTIR-5185.
See also PB91-159764, PB91-167288, PB93-120772 and PB93-502995. Sponsored by Department of Energy, Washington, DC. Federal Energy Management Program Staff.

Keywords: *Buildings, *Energy efficiency, *Life-cycle cost, Benefit cost analysis, Economic analysis, Computer applications, Energy conservation, Financial management, Operating costs, Computer programs.

The NIST Building Life-Cycle Cost computer program, version 4.0, provides economic analysis of proposed capital investments that are expected to reduce long-term operating costs of buildings or building systems/components. It is especially useful for evaluating the costs and benefits of energy conservation projects in buildings. Two or more alternative designs can be evaluated to determine which has the lowest life-cycle cost and therefore is most economical in the long run. Economic measures, including net savings, savings-to-investment ratio, adjusted internal rate of return, and years to payback can be calculated for any design alternative relative to the designated base case. BLCC can be used for evaluating Federal (including Department of Defense), state and local government projects as well as projects in the private sector. It complies with ASTM standards related to building economics as well as FEMP and OMB A-94 guidelines for economic analysis of Federal building projects.

00,027
PB93-219723 PC A05/MF A01
George Mason Univ., Fairfax, VA.
Affordable Fire Safety in Board and Care Homes. A Regulatory Challenge. Final Report.
B. M. Levin, N. E. Groner, and R. Paulsen. Jul 93, 81p, NIST/GCR-93/632.
Grant 60NANB9D0974
See also PB92-205483. Sponsored by National Inst. of Standards and Technology, Gaithersburg, MD., Administration on Aging, Washington, DC., Administration on Developmental Disabilities, Washington, DC., and National Inst. of Mental Health, Bethesda, MD.

Keywords: *Fire safety, *Nursing homes, Disabled persons, Elderly persons, Standards, Building codes, Regulations, Fire detection systems, Benefit cost analysis, Legislation, Sprinkler systems, Human factors engineering, *Board and care homes.

The report is on a project concerning fire safety in Board and Care Homes. Homes vary greatly in the level of disability of the residents and financial resources of the residents. A major concern is the availability of satisfactory care for clients with limited funds. Meeting fire safety codes can mean an unaffordable capital cost to financially marginal providers who cannot borrow money. One focus of the study is the use of the provisions in the Life Safety Code. Many agencies use these requirements and find they lead to a high level of safety without excessive costs. All have developed or adopted a procedure for rating Evacuation Difficulty that they find workable, and many find satisfactory. Other agencies use other requirements, sometimes more lenient and often more strict. Costs of fire safety systems, such as sprinklers, can vary greatly, impeding a dialogue on the benefit-cost relationships of these systems. It appears that in some locations there are many homes that provide the services of Board and Care Homes but are not regulated.

00,028
PB94-108388 PC A06/MF A02
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Balanced Design Concepts Workshop. Held in Gaithersburg, Maryland on June 30-July 2, 1993.
R. W. Bukowski. Sep 93, 116p, NISTIR-5264.

Keywords: *Fire detection systems, *Containment, *Meetings, Fire alarm systems, Fire protection, Sprinkler systems, Fire extinguishing agents, Smoke detectors, Warning systems, Safety engineering, Fire resistance.

The purpose of the workshop was to gather information and support for a study to quantify the performance and reliability of fire detection and suppression systems, and of compartmentation, and the degree to which any one could be reduced or eliminated without undue risk of loss.

00,029
PB94-110194 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Collaborating with Our Customers: NIST Building and Fire Research Laboratory.
Aug 93, 28p, NIST/SP-838/3.
Also available from Supt. of Docs. as SN003-003-03234-4.

Keywords: *Buildings, *Fire tests, *Laboratories, Test facilities, US NIST, Technology transfer, Standards, Research management, Fire safety, Hazards, Safety engineering.

The 'Perspective' describes how BFRL's (Building and Fire Research Laboratory's) projects respond to needs of the principal classes of its customers in the construction and fire safety communities: owners, designers, and constructors; producers and suppliers; standards and codes interests; and the fire services. The authors' projects address major needs and opportunities for improving the life cycle performance of constructed facilities, including: high-performance concrete and steel; 'green' building technologies; integrated, automatic control systems for operation of constructed facilities; computer-integrated, effectively automated design and construction practices; reduction of losses from unwanted fires, earthquakes, and extreme winds.

00,030
PB94-112166 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Fire Safety Engineering Div.
Zone Fire Modeling with Natural Building Flows and a Zero Order Shaft Model.
J. H. Klote, and G. P. Forney. Sep 93, 43p, NISTIR-5251.

Keywords: *Fire tests, *Buildings, *Smoke, *Computerized simulation, Space HVAC systems, Air flow, Floors, Carbon monoxide.

The paper addresses applications of zone fire models to simulate smoke flow in multistory buildings. Natural flows in buildings are discussed. A zero order model for shaft smoke flow was developed which treated the shaft as one perfectly mixed zone. A two zone fire model was modified to simulate natural flows and the zero order shaft smoke flow. The extent to which the one zone model and the two zone model are appropriate to simulate smoke flow in shafts is discussed.

00,031
PB94-112257 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Early Detection of Room Fires through Acoustic Emission.
W. Grosshandler, and E. Braun. Oct 93, 19p, NISTIR-5269.

Keywords: *Fire detection systems, *Warning systems, Acoustic detectors, Gas burners, Electric heating, Fire tests, Fire alarm systems, Heat flux, Signal processing, Safety engineering, *Acoustic emission, Room fires.

Acoustic emission (AE) previously has been shown to be a viable concept for the early indication of an open flame impinging on various structural materials. To assess its effectiveness in a more realistic environment, experiments have been performed in a 2.5 m cubical room constructed of gypsum board and wood beams. AE transducers were mounted on top of the ceiling joists and behind the center wall panel on a vertical beam. Thermocouples were mounted at several points on the wall and ceiling, and an ionization-type smoke detector was attached to the ceiling near the door opening. Two distinct fire threats were examined: (1) a flaming fire consisting of a 0.3 m diameter pan fed with natural gas to produce a thermal load of between 12 and 125 kW; and (2) a charring condition achieved by attaching a 550 W electrical heater to a vertical wooden beam located behind the gypsum board. The conclusion is that AE emission appears to be sufficiently sensitive to detect two distinct fire situations, and that an overheated condition in a wall or ceiling can be detected if it is not more than 3 m from the transducer.

00,032
PB94-121050 PC A11/MF A03
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Summaries of BFRL Fire Research In-House Projects and Grants, 1993.
N. H. Jason. Sep 93, 230p, NISTIR-5263.
See also report for 1992, PB93-116390.

Keywords: *Fire tests, *Research projects, Tests, Combustion, Fire hazards, Soot, Smoke, Sprinkler sys-

tems, Grants, Carbon monoxide, Turbulent flow, Technology transfer.

The report describes the fire research projects performed in the Building and Fire Research Laboratory (BFRL) and under its extramural grants program during Fiscal Year 1993. The BFRL Fire Research Program has directed its efforts under three program thrusts. The in-house priority projects, grants, and externally-funded efforts thus form an integrated, focussed ensemble. The publication is organized along those lines: (1) Fire Risk and Hazard Prediction; (2) Carbon Monoxide Prediction; Turbulent Combustion; Soot; Engineering Analysis; Fire Hazard Assessment; and Large Fires. (2) Fire Safety of Products and Materials; Materials Combustion; Furniture Flammability; and Wall and Ceiling Fires. (3) Advanced Technologies for Fire Sensing and Control; Fire Detection; and Fire Suppression. For the convenience of the reader, an alphabetical listing of all grants is contained in Part 2.0.

Architectural Design & Environmental Engineering

00,033
PB93-138931 PC A04/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Guidelines for Using Emulators to Evaluate the Performance of Energy Management and Control Systems.
G. E. Kelly, W. B. May, J. Y. Kao, and C. Park. Nov 92, 59p, NISTIR-4991.
Sponsored by Department of Energy, Washington, DC. Office of Conservation and Renewable Energy.

Keywords: *Energy management systems, *Simulation, *Algorithms, *Performance tests, Buildings, HVAC systems, Energy conservation, Test methods, Controllers, Control equipment, Ventilation, *Emulators.

A Building Energy Management System (BEMS) is that portion of a Building Automation System (BAS) that controls the heating, ventilation, and air conditioning (HVAC) systems in buildings. Its performance is directly related to the amount of energy consumed in a building and the comfort of the building occupants. One approach to evaluating the performance of a BEMS is through the use of an Emulator. This is a special computer/data acquisition system that is connected to the sensor inputs and command outputs of the BEMS. It replaces the HVAC system and building and uses a computer program to simulate their response to BEMS commands. The BEMS, through its supervisory and/or direct digital control algorithms, then controls the simulated building/HVAC system as if it were an actual one. At the same time, the Emulator evaluates the performance of the BEMS in terms of the energy consumed by the simulated building, the degree of comfort maintained in the simulated space, response time, accuracy, etc. The report contains guidelines for using Emulators to evaluate BEMS. An overview of the hardware and software found in a typical BEMS is presented, followed by information on: setting up a BEMS and an Emulator, evaluating system/command and DDC software, and methodologies for testing BEMS application algorithms. Considerations are also presented for evaluating a BEMS' programming capabilities, DDC control loop performance, and for rating different aspects of a BEMS' performance.

00,034
PB93-146017 PC A04/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Office of Applied Economics.
UNIFORMAT II: A Recommended Classification for Building Elements and Related Sitework.
Final rept.
B. Bowen, R. P. Charette, and H. E. Marshall. Aug 92, 57p, NIST/SP-841.
Also available from Supt. of Docs. as SN003-003-03173-9. See also PB89-129522. Prepared in cooperation with Hanscomb Associates, Inc., Atlanta, GA., and Le Groupe Hanscomb, Inc., Montreal (Quebec).

Keywords: *Classifications, *Buildings, *Specifications, *Cost engineering, Construction management, Economic analysis, Design criteria, Risk, Data bases, Value engineering, Cost control, Cost estimates, Roofs, Floors, HVAC systems, Foundations, *UNIFORMAT II.

The report describes UNIFORMAT II, a format for classifying building elements and related sitework. Elements, as defined here, are major components common to most buildings. Elements usually perform a given function, regardless of the design specification, construction method, or materials used. Elements are also commonly referred to as systems or assemblies. Using UNIFORMAT II ensures consistency in the economic evaluation of building projects over time and from project to project, and it enhances reporting at all stages in construction--from feasibility and planning through the preparation of working documents, construction, maintenance, rehabilitation, and disposal. UNIFORMAT II is a significant advance over the original UNIFORMAT classification because the new version is the result of an intensive industry review and has added elements and expanded descriptions of many existing elements. Performing an economic analysis based on an elemental framework instead of on a product-based classification reduces the time and costs for evaluating alternatives at the design stage, and thereby encourages more economic analyses and more economically efficient choices among buildings and building elements. Collecting capital, operating, and maintenance costs according to UNIFORMAT II is an efficient approach to project evaluation using life-cycle cost, net benefits, rate-of-return, and payback analyses.

00,035
PB93-146694 PC A04/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Evaluation of Compact Fluorescent Lamp Performance at Different Ambient Temperatures.
Final rept. Nov 91-Jun 92.
B. L. Collins, S. J. Treado, and M. J. Ouellette. Dec 92, 53p, NISTIR-4935.
Prepared in cooperation with National Research Council of Canada, Ottawa (Ontario).

Keywords: *Performance evaluation, *Fluorescent lamps, *Temperature dependence, Luminous intensity, Discharge lamps, Ballasts(Electric), Ignition time, Starters, Temperature effects, Power factor.

The performance of twelve different sets of compact fluorescent lamps was evaluated at six different temperatures ranging from 45 C to -18 C and compared against the performance of a set of comparable incandescent lamps. Performance measures included the following: lamp ignition time or failure, time to luminous equilibrium and electrical stabilization, relative luminous flux density, luminous flicker index for lamps with flicker rate below 240 Hz, electrical power in watts (W) and volt amps (VA), minimum lamp wall or globe temperature as applicable, relative luminous efficacy, total harmonic distortion, and power factor. In addition time to ignition was assessed for a simulated frost condition in which lamps were misted at -4 C. Analysis of the results indicated significant decrements in performance for most compact fluorescent lamps at temperatures below 0 C, with outright failure for several lamps at -18 C. Luminous output relative to the incandescent lamps remained higher for comparable wattage lamps, however, except at the very coldest temperatures.

00,036
PB93-153302 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Building Environment Div.
Performance of a Residential Desuperheater.
Final rept.
A. H. Fanney, and B. P. Dougherty. 1992, 11p.
Sponsored by Department of Energy, Washington, DC.
Pub. in ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Transactions, v98 pt1 11p 1992.

Keywords: *Heat pumps, *Residential buildings, *Water heating, Economic analysis, Water heaters, Heat exchangers, Residential energy, Heating equipment, Domestic energy, Energy consumption, Reprints, *Desuperheaters.

The performance of a residential earth-coupled heat pump having an integral desuperheating water-heating circuit is presented. The system, which includes a 50-gallon electric water heater, is located in a home in Gaithersburg, Maryland. During a 24-month monitoring period, the desuperheater contributed 27% of the total energy supplied for heating water. On a monthly basis, the desuperheater's contribution varied from less than 1% to 55%. Simple payback for the desuperheater is projected to occur by the end of the fourth year of operation. For a few selected days during the monitoring period, data were recorded every minute to gain insight into how the desuperheater and resistive elements interact in recovering the water heater. In general, the desuperheater contributed most to heating the lower portion of the tank from the setpoint of the lower thermostat, 110 F, to temperatures occasionally approaching 140 F.

00,037
PB93-153583 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Building Environment Div.
Measuring Airflow Rates with Pulse Tracer Techniques.
Final rept.
A. Persily, and J. Axley. 1990, 21p.
Sponsored by Department of Energy, Washington, DC.
Pub. in Air Change Rate and Airtightness in Buildings, ASTM STP 1067, p31-51 1990.

Keywords: *Ventilation, *Flow measurement, *Tracer techniques, Test methods, HVAC systems, Air flow, Fluid infiltration, Diagnostic techniques, Buildings, Reprints, Pulse tracer techniques.

New tracer gas techniques for measuring airflow rates in HVAC ducts and buildings airflow systems are described. These pulse tracer techniques are based upon the application of integral mass balance equations to the tracer gas concentration response of an airflow system to pulse injections of tracer. For building airflow systems, or portions of them, the airflow system is first idealized by an appropriate multi-zone model, pulse injections of tracer are applied to each zone independently, and the concentration response of each of the zones is measured. The multi-zone integral mass balance equations are formed and solved to determine the airflow rates between the zones. The airflows that are determined and the accuracy of these determinations are dependent not only upon the air exchange characteristics of the building, but also on the appropriateness of the system idealization employed. This paper presents the theoretical basis of the pulse techniques for measuring airflows in ducts, and for studying single-zone and multi-zone building airflow systems. Procedures for formulating appropriate multi-zone idealizations of building airflow systems are described and practical details of pulse testing outlined. A series of field studies are reviewed, providing examples of procedures used to formulate system idealizations, experimental techniques employed to conduct the tests, and airflow rate measurement results.

00,038
PB93-166437 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Building Environment Div.
Experimental Evaluation of Lighting/HVAC Interaction.
Final rept.
S. J. Treado, and J. W. Bean. 1990, 7p.
See also PB91-206706. Sponsored by Department of Energy, Washington, DC.
Pub. in ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Transactions, pt2 p773-779 1990.

Keywords: *Cooling load, *HVAC systems, *Lighting systems, Air flow, Lighting loads, Test facilities, Cooling systems, Ventilation, Reprints.

The interaction of building lighting and HVAC systems, and the effects on cooling load and lighting system performance, are being evaluated using a full-scale test facility at the National Institute of Standards and Technology. The test facility and measurement technology are described, along with sample test data, results and conclusions.

00,039
PB93-173458 PC A04/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Evaluation of Subjective Response to Lighting Distributions: A Literature Review.
B. L. Collins. Feb 93, 72p, NISTIR-5119.

Keywords: *Lighting systems, *Visual perception, Luminance, Physiological effects, Glare, Environmental engineering, Color, Illuminating, Comfort, Reviews.

The research literature on the subjective response to lighting and luminance distributions is reviewed. It in-

cludes an assessment of the lighting design parameters and system features which have been linked to occupant response, both positive and negative. Features such as uniformity, color, visual clarity, glare, gloom, daylighting, task lighting, and lighting geometry are addressed. Occupant response is discussed in terms of affect, preference and behavior. Both laboratory and field research results are reviewed. The review of the literature suggests strongly that luminance distribution and patterns play an important role in determining positive psychological response to lighting. These findings have important implications for lighting design.

00,040
PB93-206217 PC A04/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Lighting System Design and Evaluation in Federal Office Buildings.
Final rept. Feb 91-Jul 92.
S. J. Treado, and B. L. Collins. Mar 93, 71p, NISTIR-4960.
Sponsored by Public Buildings Service, Washington, DC. Office of Real Property Management and Safety.

Keywords: *Federal buildings, *Lighting equipment, Design standards, Energy efficiency, Ballasts(Electric), Office buildings, Lamps, Performance evaluation.

The report describes the results from a research project on developing methods for designing and selecting efficient and effective lighting systems for federal office buildings. It includes a review of current GSA and IES lighting design guidelines and a discussion of relevant testing and rating procedures. A comprehensive procedure for measuring and evaluating lighting components and systems was developed and used to assess the performance of a range of typical office lighting equipment. The procedure accounted for interactions between different components of a lighting system. The measurement results showed a wide range of performance characteristics related to light output and energy efficiency. The T-8 triphosphor lamps and electronic ballasts exhibited the best performance, but some of the more traditional lighting system components also performed well.

00,041
PB93-208445 PC A05/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Literature Review of Lighting Standards.
P. A. Sanders. Jun 93, 90p, NISTIR-5202.
Sponsored by Canadian Standards Association, Toronto (Ontario).

Keywords: *Illuminating, *Lighting equipment, *Design standards, Ballasts(Electric), Energy efficiency, Legislation, Canada, United States, Buildings.

Society's dependence on energy and increased concerns about global warming have prompted legislative bodies to implement minimum energy efficiency requirements for architectural lighting systems. The present report reviews and summarizes current Canadian and US federal legislation, US state legislation and model energy efficiency codes with particular attention to describing the minimum conformance standards.

00,042
PB94-500055 CP D02
National Inst. of Standards and Technology, Gaithersburg, MD.
Building Life Cycle Cost Computer Program (BLCC), Version 4.11 (for Microcomputers).
Software.
1993, diskette, NIST/SW/DK-93/006.
System: IBM compatible; MS DOS operating system. Open READ.ME file for installation instructions. Supersedes PB93-502995. See also PB94-500097 (ERATES).
The software is on one 3 1/2 inch diskette, 1.44M high density. Documentation included; may be ordered separately as PB93-208460 and PB93-167288.

Keywords: *Software, *Buildings, *Life cycle costs, *Energy conservation, Economic analysis, Long range(Time), Operating costs, Return on investment, Savings, Prices, Benefit cost analysis, Diskettes.

The product provides economic analysis of proposed capital investments that are expected to reduce long-term operating costs of buildings or building systems/components. It is especially useful for evaluating the costs and benefits of energy conservation projects in buildings. Two or more alternative designs can be evaluated to determine which has the lowest life-cycle cost and therefore is most economical in the long run. Economic measures, including net savings, savings-to-investment ratio, adjusted internal rate of return, and years to payback can be calculated for any design alternative relative to the designated base case. It complies with ASTM standards related to building economics as well as FEMP and OMB Circular A-94 guidelines for economic analysis of federal building projects. It has new capabilities for using demand charges and block rate calculations for computing annual electricity costs. While it is primarily intended for the economic evaluation of building systems, it can be applied to a wide range of project investments which are intended primarily to reduce future operating-related costs.

Building Equipment, Furnishings, & Maintenance

00,043
PB93-186005 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Fire Safety Engineering Div.
Bench-Scale Predictions of Mattress and Upholstered Chair Fires: Similarities and Differences.
Y. Babrauskas. Mar 93, 25p, NISTIR-5152.
Sponsored by National Inst. of Justice, Washington, DC.

Keywords: *Flammability testing, *Bedding equipment, *Upholstery, Furniture, Burning rate, Flammability, Fire tests, Fire safety, Heat flux, Fire hazards.

The report summarizes recent and current research conducted jointly by the National Institute of Standards and Technology (NIST) and the California Bureau of Home Furnishings (BHF), now the California Bureau of Home Furnishings and Thermal Insulation, to establish bench-scale test methods for the flammability of upholstered chairs and mattresses. The NIST research was funded by the National Institute of Justice (NIJ), while the BHF research was funded by the International Sleep Products Association. The research of primary interest to NIJ is the investigation of mattress flammability. The BHF heat release rate (HRR) data from full-scale burn tests was correlated with bench-scale burn tests conducted by NIST. An examination of the data for non-propagating and propagating fire regimes for mattresses enabled the development of an NIJ performance standard for the flammability of mattresses for detentions and corrections use based upon HRR limits as determined through bench-scale testing. The bench-scale tests conducted by NIST included both mattress specimens as received from the manufacturers and the same specimen subjected to a leaching procedure to remove flame retardant treatments. It was concluded that with the criteria recommended in the present standard, an adequate safety margin is provided against the diminution of fire retardancy seen with leaching.

00,044
PB93-198927 PC A04/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Discharge of Fire Suppression Agents from a Pressurized Vessel: A Mathematical Model and Its Application to Experimental Design.
L. Y. Cooper. May 93, 61p, NISTIR-5181.
Sponsored by Department of the Air Force, Wright-Patterson AFB, OH.

Keywords: *Fire extinguishers, *Mathematical models, *Nozzle flow, Fluorohydrocarbons, Halon, Fire protection, Nitrogen, Orifices, Jet flow, Pressure vessels, Fire extinguishing agents.

A mathematical model and associated computer program is developed to simulate the discharge of fire extinguishment agents from N2-pressurized vessels. The model is expected to have three applications. First, to establish an experimental design and procedure which closely simulates discharge of a field-deployed vessel; second, to evaluate the discharge characteristics of a wide range of alternative-agent/pressure-vessel configurations, thereby extending the slow and relatively costly experimental method of making such evaluations; and finally, to predict vessel exit flow conditions to be used to solve the problem of agent dispersal outside of the discharge vessel. The model is used in example calculations which address the first of these applications.

00,045
PB93-235190 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Workshop on Elevator Use during Fires. Held in Gaithersburg, Maryland on September 29, 1992.
J. H. Klote, S. P. Deal, B. M. Levin, N. E. Groner, and E. A. Donoghue. Jan 93, 21p, NISTIR-4993.
See also PB87-233771 and PB88-195946. Prepared in cooperation with George Mason Univ., Fairfax, VA., and Donoghue (Edward A.) Associates, Inc., Salem, NY.

Keywords: *Fires, *Elevators(Lifts), *Escape systems, *Meetings, Evacuating(Transportation), Handicapped persons, Field tests, Air flow, Computerized simulation, Smoke, Office buildings.

A Workshop on Elevator Use during Fires was held at the National Institute of Standards and Technology (NIST) in Gaithersburg, MD on September 29, 1992. The Workshop consisted of presentations and an open discussion. The talks were about NIST elevator research by John H. Klote, about human considerations by Bernard M. Levin and Norman E. Groner, and about industry concerns by Edward A. Donoghue. An overview of these talks is presented. The following items from the open discussion are addressed: system concepts, the hoistway water problem, elevator controls, sprinklered and unsprinklered buildings, Institutional challenges, organizational challenges, and future direction of elevator evacuation.

00,046
PB94-103678 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Sprinkler Fire Suppression Algorithm for HAZARD.
D. D. Evans. Aug 93, 23p, NISTIR-5254.
See also PB92-187145.

Keywords: *Fire tests, *Algorithms, *Sprinklers, *Cribs, Fire protection, Buildings, Fire hazards, Mathematical models, Burning rate, Fires, Spraying.

Measurements of the heat release rate of fully involved square base wood crib both before and during fire suppression with water spray from commercial sprinklers were used to develop a correlation for the exponential decay time constant of the fire heat release rate from the value at sprinkler actuation. This correlation is the basis for prediction of limits for heat release rates of furnishings during fire suppression.

00,047
PB94-108644 PC A08/MF A02
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Test Methods for Quantifying the Propensity of Cigarettes to Ignite Soft Furnishings.
Special pub.
T. J. Ohlemiller, K. M. Villa, E. Braun, J. Randall Lawson, R. G. Gann, K. R. Eberhardt, and R. H. Harris. Aug 93, 169p, NIST/SP-851.
Also available from Supt. of Docs. See also PB90-169327.

Keywords: *Test methods, *Flammability testing, *Ignition, *Furniture, Upholstery, Fire tests, Tobacco, Statistical analysis, Bedding equipment, *Cigarettes.

Research funded under the Fire Safe Cigarette Act of 1990 (P.L. 101-352) has led to the development of two test methods for measuring the ignition propensity of cigarettes. The Mock-Up Ignition Test Method uses substrates physically similar to upholstered furniture and mattresses: a layer of fabric over padding. The measure of cigarette performance is ignition or non-ignition of the substrate. The Cigarette Extinction Test Method replaces the fabric/padding assembly with multiple layers of common filter paper. The measure of performance is full-length burning or self-extinguishment of the cigarette. Routine measurement of the relative ignition propensity of cigarettes is feasible using either of the two methods. Improved cigarette performance under both methods has been linked with reduced real-world ignition behavior; and it is reasonable to assume that this, in turn, implies a significant real-world benefit. Both methods have been subjected to interlaboratory study. The resulting reproducibilities were comparable to each other and comparable to those in other fire test methods currently being used

to regulate materials which may be involved in unwanted fires. Using the two methods, some current commercial cigarettes are shown to have reduced ignition propensities relative to the current best-selling cigarettes.

00,048
PB94-109014 PC A08/MF A02
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Modeling the Ignition of Soft Furnishings by a Cigarette.
Special pub. (Final).
H. E. Mitler, and G. N. Walton. Aug 93, 171p, NIST/SP-852.
Also available from Supt. of Docs. See also PB87-201869, PB88-169982 and PB90-241480.

Keywords: *Ignition, *Furniture, User manuals(Computer programs), Upholstery, Pyrolysis, Mathematical models, Heat flux, Bedding equipment, Flammability, Convection, *Cigarettes, CIGARET computer program, SUBSTRAT computer program.

The paper describes the user-friendly computer models CIGARET and SUBSTRAT. CIGARET calculates the time-dependent behavior of a cigarette smoldering quietly in the air, away from surfaces. The model incorporates diffusion and convection of gases, as well as the kinetics of char oxidation. It calculates the internal heat fluxes, as well as the internal distributions of temperature, gas velocity, and oxygen concentration. SUBSTRAT determines whether a two-layer solid (with an air gap in between), exposed to a moving heating flux such as is produced by a cigarette, will ignite. Among the processes taken into consideration are three-dimensional heat conduction in the substrate and its pyrolysis. This model has successfully simulated the thermal runaway signifying smoldering ignition of the substrate when it is exposed to a set of external heating fluxes. SUBSTRAT and CIGARET have been designed to work in tandem to simulate the most frequent cause of fatal fires: cigarette ignition of upholstered furniture and bedding. Users' guides are included.

Construction Materials, Components, & Equipment

00,049
AD-A956 270/3 PC A03/MF A01
National Bureau of Standards, Washington, DC. Inst. for Applied Technology.
Hail Resistance of Roofing Products.
S. H. Greenfeld. Aug 69, 11p.
Errata sheet included.

Keywords: *Roofs, *Hail, *Impact tests, *Damage, Performance(Engineering), Test and evaluation, Resistance, Vulnerability, Construction materials, *Roofing, U/A Report, Shingles.

A test was developed for evaluating the hail resistance of roofings, in which synthetic hail-stones (ice spheres) of various sizes were shot at roof assemblies at their free-fall terminal velocities. Indentations, granule loss and roofing fracture were observed. The following conclusions have been made from these results: All roofing materials have some resistance to hail damage, but as the size of the hail increases, a level of impact energy is reached at which damage occurs. This level lies in the range of 1 1/2 to 2 inch (3.8-5.1 cm) hailstones for most prepared roofings. Because of the ways in which prepared roofings are applied, most products have areas of different vulnerability. The solidly supported areas of roofing tend to be the most resistant to hail damage. Heavier shingles tend to be more hail-resistant than Type 235 shingles. Weathering tends to lower the hail resistance of asphalt shingles. Built-up roofs on dense substrates tend to resist hail better than those on soft substrates. Built-up roofs made with inorganic felts tend to be more hail resistant that those made with organic felts. Coarse aggregate surfacing tends to increase the hail resistance of roofing.

00,050
PB93-124808 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Fire Measurement and Research Div.
Heat Release Rate: The Single Most Important Variable in Fire Hazard.
Final rept.
V. Babrauskas, and R. D. Peacock. 1992, 18p.
See also PB91-146977.
Pub. in Fire Safety Jnl. 18, p255-272 1992.

Keywords: *Fire hazards, *Flammability, *Buildings, Safety, Fire tests, Toxicity, Fatalities, Burning rate, Flammability testing, Reprints, *Heat release rate.

Heat release rate measurements are sometimes seen by manufacturers and product users as just another piece of data to gather. It is the purpose of this paper to explain why heat release rate is, in fact, the single most important variable in characterizing the 'flammability' of products and their consequent fire hazard. Examples of typical fire histories are given which illustrate that even though fire deaths are primarily caused by toxic gases, the heat release rate is the best predictor of fire hazard. Conversely, the relative toxicity of the combustion gases plays a smaller role. The delays in ignition time, as measured by various Bunsen burner type tests, also have only a minor effect on the development of fire hazard.

00,051
PB93-138980 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Acoustic Emission of Structural Materials Exposed to Open Flames.
W. Grosshandler, and M. Jackson. Dec 92, 27p, NISTIR-4984.

Keywords: *Acoustic signals, *Fire tests, *Plywood, Fire detection systems, Acoustic measurement, Construction materials, Test facilities, Transducers, Signal processing, Heat flux, Fires.

The use of acoustic emission (AE) as an early indicator of a hidden structural fire has been investigated and found to be a viable, but undeveloped, concept. Piezoelectric transducers have been mounted directly on 0.5 m long, simply supported beams of different structural materials (aluminum, gypsum board, wood and plastic), and have been used to record ultrasonic events resulting from a small flame placed under the beam. The number of AE events in a minute and the cumulative energy released during the heating cycle provide a good measure of the overheated state of some of these materials even before a temperature increase is indicated. The measured signals varied in energy and number with the type of material, the thickness of the specimen and heat flux. Wood was particularly susceptible to acoustic emission, producing more than 1000 events per minute in a solid fir board and 30/min in a 13 mm thick plywood when the flame exceeded 1.0 kW. A gypsum board produced 16 events in a minute. An aluminum plate did not respond above the background level (0.3 events/minute) even though it reached the highest temperature. The differences in cumulative energy were equally striking, with the plywood being four times more energetic than the gypsum board even though the heating period for the wood was half as long, and 30 times more energetic than the aluminum.

00,052
PB93-139046 PC A04/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Building Environment Div.
Controlling Moisture in the Roof Cavities of Manufactured Housing.
Final rept.
D. M. Burch. Nov 92, 51p, NISTIR-4916.
Sponsored by Department of Housing and Urban Development, Washington, DC.

Keywords: *Roofs, *Moisture resistance, *Construction materials, *Prefabricated buildings, *Attics, Humidity, Porosity, Moisture content, Ventilation, Permeability, Diffusion, Boundary conditions, Interfaces, Residential buildings, *Manufactured housing.

A detailed computer analysis is conducted to investigate whether moisture problems occur in the roof cavity of manufactured homes constructed in compliance with the current Department of Housing and Urban Development (HUD) Standards for manufactured housing. The current HUD Standards require a ceiling vapor retarder, but do not require outdoor ventilation of the roof cavity. In cold climates, the analysis revealed that moisture accumulates at lower roof surface and poses a risk of material degradation. The analysis found the following combination of passive measures to be effective in preventing detrimental winter moisture accumulation at lower surface of the roof: (1) providing a ceiling vapor retarder, (2) sealing penetrations and openings in the ceiling construction, and (3) providing natural ventilation of the roof cavity. In addition, the performance of a roof cavity subjected to a hot and humid climate is investigated. The analysis revealed that outdoor ventilation of the roof cavity causes the monthly mean relative humidity at the upper surface of the vapor retarder to exceed 80%. The condition is conducive to mold and mildew growth.

00,053
PB93-139103 PC A06/MF A02
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Reduction of Hydrogen Cyanide Concentrations and Acute Inhalation Toxicity from Flexible Polyurethane Foam Combustion Products by the Addition of Copper Compounds. Part IV. Effects of Combustion Conditions and Scaling on the Generation of Hydrogen Cyanide and Toxicity from Flexible Polyurethane Foam with and without Copper Compounds.
B. C. Levin, E. Braun, M. Paabo, R. H. Harris, and M. Navarro. Dec 92, 115p, NISTIR-4989.
See also PB91-132167. Sponsored by International Copper Association, Ltd., New York, and Society of the Plastics Industry, Inc., New York.

Keywords: *Toxicity, *Combustion products, *Hydrogen cyanide, *Polyurethane resins, *Copper compounds, Fire hazards, Fires, Foam rubber, Thermal degradation, Oxidation, Fire tests.

Two full-scale protocols (A & B) were tested to determine the efficacy of cuprous oxide (Cu2O) in reducing the concentrations of hydrogen cyanide (HCN) from flexible polyurethane foams (FPU) when thermally decomposed under realistic room conditions. In each Protocol A test, a FPU cushion (untreated or treated with 0.1% Cu2O) was cut in half, and the two halves were stacked on a load cell in a closed room. The ignition source was a hot wire placed between the two halves. Rats were exposed to the decomposition products to examine the toxicological effects of the foams with and without Cu2O. Protocol B differed from Protocol A in that chairs were simulated by four FPU cushions attached to a steel frame; the treated FPU contained 1.0% Cu2O; the cushions were covered with a cotton fabric; the chairs were ignited with cigarettes; and the burn room was open and connected to a corridor. In both protocols, the thermal decomposition progressed through nonflaming, smoldering and flaming phases and the concentrations of HCN and other gases were monitored. Foams used in the full-scale room burns were also examined under small-scale conditions (under flaming or a two-phase nonflaming/ramped heating mode) in the cup furnace smoke toxicity method. Both atmospheric and reduced O2 conditions were studied. The small-scale tests showed an 87% reduction in the concentration of HCN and a 40 to 73% reduction in the toxicity of the thermal decomposition products when the Cu2O-treated foams were tested. In the full-scale tests, the concentration of HCN was reduced 70% when the FPU contained 1.0% Cu2O, but not when the foams contained 0.1% Cu2O.

00,054
PB93-139111 PC A04/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Test Methods for Detention and Correctional Facility Locks.
C. W. C. Yancey. Nov 92, 52p, NISTIR-4975.
Sponsored by National Inst. of Justice, Washington, DC.

Keywords: *Test methods, *Standards, *Locks(Fasteners), *Correctional institutions, Mechanical properties, Performance tests, Impact tests, Mechanical tests, Fire resistance, Constraining.

Draft test methods are presented for evaluating locks installed in detention and correctional facilities. The methods have been developed by ASTM (American Society for Testing and Materials) Committee F 33 on Detention and Correctional Facilities and are drafted in ASTM standard test method format. The NIST contribution to this effort is to assist the F 33 Committee in drafting, balloting and obtaining consensus approval for these test methods. Existing standards for residential and commercial locks have been reviewed to determine their applicability to the evaluation of locks subject to the abuse common to detention and correctional facilities. Synopses of relevant standards are pre-

sented in this report. A case is made for performing laboratory tests on prototype locks to quantify current performance levels and to establish a classification system for detention-facility locks. Gaps in the knowledge base are identified and recommendations are advanced for performing a series of cyclical operations, impact and lockbolt retraction tests. The results from the recommended laboratory test program would be used to prepare a minimum performance standard for promulgation by the National Institute of Justice.

00,055
PB93-140788 PC A06/MF A02
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
User's Guide for CFAST Version 1.6.
R. W. Portier, P. A. Reneke, W. W. Jones, and R. D. Peacock. Dec 92, 107p, NISTIR-4985.

Keywords: *User manuals(Computer programs), *Fires, Algorithms, Ventilation, Subroutines, Smoke, Toxicity, Computer programs, Geometry, Air flow, Buildings, *CFAST computer program, *Compartment fires.

CFAST is a zone model capable of predicting the environment in a multi-compartment structure subjected to a fire. This guide provides a detailed description of the pre- and post-processing routines used by the model, the data input requirements and the output produced by version 1.6 of the model.

00,056
PB93-146298 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Performance Standard for Wood-Based Structural-Use Panels.
Final rept.
B. Melgs. Dec 92, 38p, NIST/PS-2/92.
Also available from Supt. of Docs. as SN003-003-03181-0. Sponsored by American Plywood Association, Tacoma, WA.

Keywords: *Standards, *Test methods, *Panels, *Wood products, Durability, Plywood, Construction materials, Moisture content, Mechanical properties, Particle boards, Wallboard.

The standard covers the performance requirements, adhesive bond durability, panel construction and workmanship, dimensions and tolerances, marking, and moisture content of structural-use panels. It covers a variety of products, including plywood, waferboard, oriented strand board, structural particleboard, and composite panels. The Standard classifies panels by exposure durability and by grade. It provides test methods, a glossary of trade terms and definitions, and a quality certification program whereby agencies inspect, sample, and test products for qualification under this standard. Information regarding reinspection practices is provided in an appendix.

00,057
PB93-146678 PC A04/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Smoke Movement in a Corridor-Hybrid Model, Simple Model and Comparison with Experiments.
T. Matsushita, and J. H. Klote. Dec 92, 53p, NISTIR-4982.

Keywords: *Smoke, *Mathematical models, *Fires, *Buildings, Transport properties, Heat transfer, Fluid dynamics, Fire tests, Temperature distribution, Equations of motion, Temperature dependence, *Smoke movement, *Corridors.

A hybrid model for simulating smoke movement in a corridor is described. This model uses a two zone approach which considers velocities in each zone, and uses a fine mesh in the direction of propagation. Two different approaches to deal with the pressure term are addressed. Full scale and reduced scale experiments are described and compared with the results of the hybrid model. Since heat transfer is not presently incorporated in the hybrid model, the simulated velocity of spread is constant. But in the experiment, the velocity drops with advancing time. A simple model with heat transfer is also described. This model is similar to the density flow model, and assumes that the movement of the smoke front (nose) is similar to the flow through vertical openings in a zone model. Results of the simple model are compared with the experiment with heat transfer, and the effect of the heat transfer coefficient is observed.

00,058
PB93-146686 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Observations from a Field Study of the Performance of Polymer-Modified Bitumen Roofing.
W. J. Rossiter, and R. D. Denchfield. Jan 93, 45p, NISTIR-4972.
Prepared in cooperation with Denchfield Corp., Silver Spring, MD.

Keywords: *Bitumens, *Roofing, *Deterioration, Roofs, Construction materials, Membranes, Polymers, Standards, Defects, Asphalts, Performance evaluation.

The report presents the results of a field study of polymer-modified bitumen roofing. Observations on in-service performance are beneficial for identifying field problems that require study to attain solutions. Fifty-three roofs, ranging in age from 24 to 131 months and located in Washington/Baltimore, Jacksonville, Florida, and Dallas, Texas, were inspected. The types of membrane modifiers were almost equally distributed between atactic polypropylene and styrene-butadiene-styrene polymers. Re-roofing predominated the type of construction and was divided somewhat evenly between tear-off and re-covering. The overall performance of these relatively young roofs was considered to be satisfactory. About 70 percent of the roofs were considered visually to be in fine condition. Still, about a quarter of the roofs showed some defects that contributed to a lowered performance ranking.

00,059
PB93-151231 Not available NTIS
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Building Materials Div.
Geochemical Considerations in the Cleaning of Carbonate Stone.
Final rept.
R. Livingston. 1992, 15p.
Pub. in Proceedings of International Conference on Stone Cleaning, and the Nature, Soiling and Decay Mechanisms of Stone, Edinburgh, Scotland, UK., April 1992, p166-180.

Keywords: *Cleaning, *Marble, *Limestone, *Air pollution effects(Materials), Deterioration, Specifications, Carbonate rocks, Gypsum, Construction materials, pH, Carbon dioxide, Chelating agents, Chemical reactions, Reprints.

The specification of solutions for cleaning of limestone and marble is of major concern for several reasons. First, these materials have been very widely used for sculpture and architecture. Second, the soiling and discoloration of these surfaces is often the result of chemical processes, such as the formation of gypsum, that make cleaning more difficult. Finally, solutions in contact with carbonate stone will change in pH and ionic composition because of interactions with the stone and atmospheric carbon dioxide. Many types of solutions have been suggested for cleaning carbonate stone. These include deionized or distilled water, acidic solutions, solutions saturated with calcite and solutions containing chelating agents such as EDTA. However, the use of a chemically incompatible cleaning could, at best, be ineffective and, at worst, could cause damage to the stone. Geochemical theory can help to clarify the situation.

00,060
PB93-151249 Not available NTIS
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Building Materials Div.
Graphical Methods for Examining the Effects of Acid Rain and Sulfur Dioxide on Carbonate Stones.
Final rept.
R. A. Livingston. 1992, 12p.
Pub. in Proceedings of International Congress on Deterioration and Conservation of Stone (7th), Lisbon, Portugal, June 14-18, 1992, p375-386.

Keywords: *Air pollution effects(Materials), *Limestone, *Marble, *Deterioration, Urban areas, Acid rain, Sulfur dioxide, Deposition, Dry methods, Carbonate rocks, Air pollution control, Electrolytes, Calcium, Runoff, Gypsum, Construction materials, Dissolution, Reprints.

Both acid rain and dry deposition of sulfur dioxide cause dissolution of carbonate building stone. It is important to distinguish between the two processes for purposes of developing air pollution control policies, since dry deposition comes primarily from local sources of air pollution while acid rain generally results from long range transport from distant sources. Runoff experiments are a common method used to investigate this problem, but this kind of study is complicated by the additional dissolution of carbonate stone dissolves in natural, unacidified rainwater through the karst process. This paper shows that by using data transformations based on electrolyte theory and carbonate equilibria, the total observed dissolution of calcium from the stone can be partitioned into components of acid rain, dry deposition and natural or karstic dissolution. The data can then be plotted on either a triaxial diagram or on the calcite/gypsum phase diagram for visual interpretation. The triaxial diagram provides an index of the relative importance of the three carbonate dissolution processes, while the phase diagram puts the effect of an individual rain event in perspective against saturation with respect to calcite or gypsum. In the examples presented here, the amount of dissolution by natural processes is comparable to, or greater than, the effect of acid deposition. In urban areas where there is significant ambient levels of SO2, the dry deposition effect often dominates over the other two processes. In such conditions the acid rain signal may be lost in the error of the dissolved calcium measurement.

00,061
PB93-151280 Not available NTIS
National Inst. of Standards and Technology (NML), Boulder, CO. Chemical Engineering Science Div.
Interlaboratory Comparison of the Apparent Thermal Conductivity of a Fibrous Batt and Four Loose-Fill Insulations.
Final rept.
D. J. McCaa, and D. R. Smith. 1991, 24p.
Pub. in Proceedings of ASTM (American Society for Testing and Materials) Symposium on Thermal Insulation, Gatlinburg, TN., October 1991, 24p.

Keywords: *Thermal conductivity, *Thermal insulation, Test methods, Thermal resistance, Thermal diffusivity, Accuracy, Heat transmission, Glass fibers, Test facilities, Interlaboratory comparisons, Reprints.

An interlaboratory comparison of measurements of the apparent thermal conductivities of four loose-fill insulations was conducted according to ASTM Standard Practice C 687 in order to prepare a revised statement of precision and bias. The apparatus used included one guarded hot plate, one thin-heater apparatus, and eight heat-flow meters. All specimens were tested at a mean temperature of 24 C (75 F). Test results for fibrous glass blanket were used to characterize the basic imprecision (numerical measure of precision) of the test instruments. The 2 sigma imprecisions of measurement of apparent thermal conductivity were 2.8% for fibrous glass blanket, 5.8% for cellulose, 9.4% for unbonded glass fiber, 10.5% for mineral wool, and 5.0% for perlite.

00,062
PB93-152056 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Simulating the Effect of Beamed Ceilings on Smoke Flow. Part 1. Comparison of Numerical and Experimental Results.
G. P. Forney, W. D. Davis, and J. H. Klote. Dec 92, 27p, NISTIR-4994.
See also PB92-156751 and PB92-191253.

Keywords: *Computational fluid dynamics, *Ceilings, *Smoke, *Air flow, *Fires, Beams(Supports), Mathematical models, Temperature distribution, Computerized simulation, Numerical analysis, Flow distribution, *Smoke flow.

The flow of smoke under beamed ceilings is simulated using a field model. The work was performed in order to confirm that fire detector response can be evaluated using computational data obtained from numerical simulations as well as laboratory data obtained from experiments. The field model is verified for the application by showing that its temperature predictions match experimental results obtained earlier by Heskestad and Delichatsios. Line plots are presented which show that the numerical and experimental temperature measurements are in good agreement. Contour plots are also presented that show the temperature distribution in the channels formed by the ceiling beams. Finally some preliminary results involving the effect of beam depth on smoke flow are presented.

00,063
PB93-153161 Not available NTIS

National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Building Materials Div.
Computer Modelling of Cement-Based Materials.
Final rept.
D. P. Bentz, and E. J. Garboczi. 1992, 5p.
Pub. in CRAY Channels 14, n3 p12-16 1992.

Keywords: *Concretes, *Computerized simulation, Hydration, Admixtures, Concrete durability, Interfaces, Mathematical models, Microstructure, Physical properties, Stiffness, Transport properties, Reprints.

Cement-based materials are one of the most widely used construction materials in the world and their performance is critical to the nation's infrastructure. One key area of research for these materials is to understand the fundamental relationships that exist between microstructure and properties, such as stiffness, strength, transport coefficients, and durability. Computer modelling has proven a valuable tool in elucidating these key relationships. Through the National Science Foundation Science and Technology Center for Advanced Cement-Based Materials, access to the CRAY-2 supercomputer at the Massachusetts Institute of Technology was provided by Cray Research, Inc. The computer was utilized to study, via large scale simulation, the microstructure of the interfaces between cement paste and aggregates, the two major components of concrete. The effects of various mineral admixtures on interfacial zone microstructure was investigated in a quantitative manner using the simulation model.

00,064
PB93-153179 Not available NTIS
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Building Materials Div.
Experimental and Simulation Studies of the Interfacial Zone in Concrete.
Final rept.
D. P. Bentz, P. E. Stutzman, and E. J. Garboczi. 1992, 12p.
Pub. in Cement and Concrete Research 22, p891-902 1992.

Keywords: *Concretes, *Interfaces, Computerized simulation, Aggregates, Microstructure, Physical properties, Mathematical models, Silicone dioxide, Hydration, Chemical reactions, Reprints.

Since concrete is a composite material, the interfaces between components can be expected to have major effects on physical properties. In ordinary portland cement concrete, the interfacial zone between cement paste and aggregate has been shown to exhibit characteristics greatly differing from those of the bulk paste. The addition of mineral admixtures to the mix has been shown to significantly alter this interfacial zone microstructure and enhance physical properties of the composite. In this paper, a direct comparison is made between results obtained using a three-dimensional microstructural model and those obtained experimentally on a similar set of mixes containing various amounts of silica fume. Quantitative measurements of backscattered electron images of the interfacial zone in the real materials are compared to model results. The model reproduces the experimentally-observed characteristics of the interfacial zone, which are quite different with and without the presence of silica fume.

00,065
PB93-153229 Not available NTIS
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Building Environment Div.
Water Vapor Permeability Measurements of Common Building Materials.
Final rept.
D. M. Burch, W. C. Thomas, and A. H. Fanney. 1992, 9p.
Sponsored by Department of Energy, Washington, DC., and Department of Housing and Urban Development, Washington, DC.
Pub. in ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Transactions, v98 pt2 9p 1992.

Keywords: *Construction materials, *Permeability, *Water vapor, Moisture content, Humidity, Plywood, Wood products, Temperature effects, Measuring methods, Reprints.

A cup method was used to measure water-vapor transmission in 10 common building materials. The materials included sugar pine, sturdy-brace fiberboard, fiberboard sheathing, particleboard, exterior-grade plywood, plain gypsum board, kraft paper, waferboard siding, vinyl-covered gypsum board, and foam core sheathing. For each material, a series of cup measurements was conducted, and the permeability (or permeance) was plotted as a function of the mean relative humidity across the specimen. Separate measurements, carried out at 24 C (75 F) and 7 C (44 F), indicated that temperature has an insignificant effect on permeability. The permeability measurements were compared with other measurements reported in the literature, and the agreement was good in most cases.

00,066
PB93-153252 Not available NTIS
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Fire Science and Engineering Div.
Feeling a Door to See if Fire is on the Other Side.
Final rept.
L. Y. Cooper, and H. E. Nelson. 1992, 6p.
Pub. in Fire Technology 28, n3 p251-256 Aug 92.

Keywords: *Doors, *Fire protection, Surface properties, Fires, Surface temperature, Smoke, Fire fighting, Thermal protection, Safety, Reprints.

The paper considers door assemblies that separate a fire environment from a protected space. It analyzes three methods of 'feeling a door' on the protected side that can assist in determining the existence of a direct fire threat on the other side. These methods are: (1) feeling the door surface to determine whether or not it is at an elevated temperature; (2) feeling, smelling and visual inspection of the door edges to determine possible smoke flows from an adjacent fire environment; (3) feeling the door-knob to determine whether or not it is at an elevated temperature. It is determined that a practical and effective strategy can be developed which uses all three methods to establish the existence of a fire threat without direct exposure to the fire environment. Of all methods discussed, the most reliable single indicator involves touching the base of the door-knob.

00,067
PB93-153385 Not available NTIS
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Fire Science and Engineering Div.
Fire Information Challenges of the 21st Century.
Final rept.
N. H. Jason. 1992, 2p.
Pub. in Fire Technology 28, n3 p283-284 Aug 92.

Keywords: *Fires, *Information retrieval, Meetings, Data bases, Information systems, Fire protection, Combustion, Fire safety, Safety engineering, Buildings, Reprints.

The article summarizes the First International Fire Information Conference and the Conference for Exploration of a National Engineering Information Service.

00,068
PB93-153674 Not available NTIS
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Building Environment Div.
Water Vapor Sorption Measurements of Common Building Materials.
Final rept.
R. F. Richards, D. M. Burch, and W. C. Thomas. 1992, 11p.
Sponsored by Department of Energy, Washington, DC.
Pub. in ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Transactions, v98 pt2 11p 1992.

Keywords: *Construction materials, *Water vapor, *Adsorption, Moisture content, Mass transfer, Steady state, Plywood, Wood products, Humidity, Surface properties, Test methods, Reprints.

Sorption isotherm measurements were carried out for common building materials. The measurements were made by placing small specimens of the materials in pint-size jars above saturated salt-in-water solutions that gave various ambient relative humidities. The jars were kept at constant temperature until the enclosed specimens reached their steady-state equilibrium moisture content. The equilibrium moisture content plotted versus ambient relative humidity at a given temperature gave the sorption isotherm. Separate sorption isotherms were obtained for specimens initially dry (adsorption isotherm) and for specimens initially saturated (desorption isotherm). The materials included sugar pine, southern pine, exterior-grade plywood, waferboard siding, oriented strand board, particleboard, fiberboard sheathing, sturdy-brace fiberboard, kraft paper, foam-core sheathing, plain gypsum board, and vinyl-covered gypsum board.

00,069
PB93-153724 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Building Materials Div.
Interim Criteria for Polymer-Modified Bituminous Roofing Membrane Materials: A Summary Report.
Final rept.
W. J. Rossiter, and J. F. Seller. 1989, 6p.
See also PB89-168025.
Pub. in International Jnl. of Roofing Technology 1, n1 p19-24 1989.

Keywords: *Bituminous materials, *Roofing, *Membranes, *Design criteria, Standards, Polymers, Construction materials, Test methods, Roofs, Bitumens, Reprints, *Polymer-modified bituminous roofing membranes.

The paper presents a summary of the NIST study to suggest criteria for polymer-modified bituminous roofing membrane materials. Criteria were suggested for 15 membrane properties including load-elongation, low-temperature flexibility, tear resistance, hail impact, strain energy, dimensional stability, and heat exposure. In addition, proposals were made for research to develop criteria on properties such as cyclic movement resistance, puncture resistance, seam strength, and weather exposure.

00,070
PB93-166403 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Building Environment Div.
Experimental Validation of a Mathematical Model for Predicting Water Vapor Sorption at Interior Building Surfaces.
Final rept.
W. C. Thomas, and D. M. Burch. 1990, 10p.
See also PB89-150783. Sponsored by Department of Energy, Washington, DC.
Pub. in ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Transactions, v96 pt1 p487-496 1990.

Keywords: *Construction materials, *Moisture content, *Diffusion, *Mathematical models, Buildings, Walls, Finite difference method, Wallboard, Coatings, Water vapor, Ventilation, Reprints.

A mathematical model for predicting moisture sorption rates at building surfaces is presented. The governing heat and moisture transfer equations are solved by an implicit finite-difference method. The effects of surface coatings are included in the formulation. Laboratory experiments were conducted to verify the model. Disk-shaped specimens of unpainted gypsum board, gypsum board painted with a latex paint system, and unpainted white pine were used. Sorption isotherms and diffusion coefficients for these materials were independently measured. The specimens were initially conditioned to a uniform moisture content and then moved to an environment with a lower relative humidity. The moisture transfer rates at the surfaces of the specimens were determined as a function of time and compared to predictions by the mathematical model.

00,071
PB93-174902 PC A11/MF A03
National inst. of Standards and Technology (BFRL), Gaithersburg, MD.
CFAST, the Consolidated Model of Fire Growth and Smoke Transport.
Technical note (Final).
R. D. Peacock, G. P. Forney, P. Reneke, R. Portier, and W. W. Jones. Feb 93, 245p, NIST/TN-1299.
Also available from Supt. of Docs. as SN003-003-03194-1. See also PB91-144436, PB93-140788 and PB-297 452.

Keywords: *Smoke, *Fires, *Buildings, Transport properties, Combustion, Combustion products, Mathematical models, Plumes, Pyrolysis, Computer programs, *CFAST computer program.

CFAST is a zone model capable of predicting the environment in a multi-compartment structure subjected to a fire. It calculates the time evolving distribution of smoke and fire gases and the temperature throughout a building during a user-specified fire. The report describes the equations which constitute the model, the physical basis for these equations, data which are used by the model, and details of the operation of the computer program implementing the model. A set of comparisons between the model and a range of real-scale fire experiments is presented. In general, the

CFAST model compares favorably with the experiments examined in the paper. Although differences between the model and the experiments were clear, they can be explained by limitations of the model and of the experiments. The paper documents the equations which are used in CFAST and how they are implemented. The means by which one can add new phenomena is detailed, as are the variables and structure of the model.

00,072
PB93-183754 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Design of Smoke Control Systems for Areas of Refuge.
J. H. Klote. Mar 93, 28p, NISTIR-5132.
Sponsored by Public Buildings Service, Washington, DC. Office of Real Property Management and Safety.

Keywords: *Buildings, *Smoke, *Survival, Air flow, Safety factor, Leakage, Windows, Mathematical models, Pressure gradients, Wind(Meteorology).

There is a rising concern for the safety of persons from fire who cannot travel building emergency exit routes in the same manner or as quickly as expected of able persons. One proposed solution for providing safety for persons with mobility limitations is the concept of areas of refuge (AOR) where they can 'safely wait' until they can be assisted in leaving the building. This paper presents information about the design of smoke control systems to prevent smoke infiltration into an AOR. Pressure differences produced when windows break both with and without wind can be significant, and the design of a smoke control system for an AOR needs to address these pressure differences. The paper identifies that wind data specifically for the design of smoke control systems is needed. The pressure fluctuations due to opening and closing building doors during fire situations can also be significant, and the design of a smoke control system for an AOR needs to address these pressure fluctuations. An example analysis incorporating the pressure effects of broken windows, wind, and open doors illustrates the feasibility of designing smoke control systems for areas of refuge.

00,073
PB93-188845 PC A05/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Building and Fire Research Laboratory Publications, 1992.
N. H. Jason. Apr 93, 88p, NISTIR-5172.
See also report for 1991, PB93-116465.

Keywords: *Buildings, *Research projects, *Fires, *Bibliographies, Combustion, Computerized simulation, Mathematical models, Building codes, Construction materials, Fire protection, Fire resistance, Building and Fire Research Laboratory.

Building and Fire Research Laboratory Publications, 1992 contains references to the publications prepared by the members of the Building and Fire Research Laboratory (BFRL) staff, by other National Institute of Standards and Technology (NIST) personnel for BFRL, or by external laboratories under contract or grant from the BFRL during the calendar year 1992. NIST Report series are available for purchase from either the Government Printing Office (GPO) or the National Technical Information Service (NIST).

00,074
PB93-205623 PC A04/MF A01
Kentucky Univ., Lexington. Dept. of Mechanical Engineering.
Study of Fire Induced Flow along the Vertical Corner Wall. Part 2.
Final rept.
K. Saito. Apr 93, 63p, NIST/GCR-93/628.
Grant 60NANB1D1142
Sponsored by National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.

Keywords: *Fires, *Walls, *Buildings, *Flow measurement, *Infrared thermography, Velocity measurement, Pyrolysis, Temperature measurement, Flame propagation, Test facilities, Fire tests, Infrared filters, *Corner fires.

The paper describes a new experimental technique with wide application which has been proven for corner fires. To measure the flame spread rate of pyrolysis front along vertically oriented flat and corner walls, it may be necessary to measure transient temperature profiles on the walls. Conventional thermocouple and visual observation methods, however, have limitations due to complexity of implementation and the inherent ambiguity of visual observations due to interference from flames. To overcome these limitations, automated infrared imaging was applied for simultaneously collecting temperature data in a relatively large wall surface area. Results indicate that the infrared system with a band-pass filter successfully avoids the flame interference allowing measurements of temperature distribution on the fire-heated wall, from which the spread rate in any direction can be deduced. The infrared camera without filters also can be used to measure visible flame position as photographic and video camera.

00,075
PB93-206183 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Research Plan for Masonry Shear Walls.
S. G. Fattal. Jun 93, 36p, NISTIR-5117.
See also PB93-206225 and PB91-167189.

Keywords: *Building codes, *Masonry, *Walls, Design standards, Loads(Forces), Compressive strength, Shear strength, Construction, Earthquake engineering, Seismic design, Research management.

A masonry research plan is presented based on studies of the behavior of masonry shear walls conducted at the National Institute of Standards and Technology (NIST). The purpose of the plan is to acquire additional information to allow formulation of a design methodology. It consists of experimental and analytical investigations of masonry shear walls subjected to simulated earthquake loads. The experimental program consists of tests of lightly-reinforced and partially-grouted specimens representing design and construction practices in regions of low-to-moderate seismicity. The analytical work consists of formulations of equations to evaluate strength and deformation limit states and numerical studies of discrete models.

00,076
PB93-206894 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Effect of Critical Parameters on the Behavior of Partially-Grouted Masonry Shear Walls under Lateral Loads.
S. G. Fattal. Jun 93, 49p, NISTIR-5116.
See also PB92-116342 and PB91-167189.

Keywords: *Masonry, *Walls, *Ultimate strength, Shear stress, Lateral pressure, Earthquake engineering, Loads(Forces), Seismic design, Research management, Shear stress, Building codes, Design standards.

The effect of critical parameters on the lateral-load response characteristics of partially-grouted masonry shear walls is evaluated by conducting a synthesis of available experimental data and by utilizing a predictive equation to estimate ultimate shear strength. The results of the study indicate a need to supplement the existing data base with additional experimental and analytical research to develop an adequate basis for design of masonry shear walls. Recommendations are made on the specific areas of research to accomplish this design objective.

00,077
PB94-103694 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Combined Buoyancy- and Pressure-Driven Flow through a Horizontal Vent: Theoretical Considerations.
L. Y. Cooper. Sep 93, 20p, NISTIR-5252.

Keywords: *Buoyancy, *Vents, *Convection, *Fires, Boundary value problems, Ventilation, Mathematical models, Buildings, Fluid flow, Pressure.

Flow through a horizontal vent is considered where the vent-connected spaces near the elevation of the vent are filled with fluids of different density in an unstable configuration, with the density of the top space larger than that of the bottom space. With zero-to-moderate cross-vent pressure difference the instability leads to a bi-directional exchange flow between the two spaces. For relatively large cross-vent pressure difference the flow through the vent is unidirectional, from the high-pressure to the low-pressure space. For arbitrary specified cross-vent pressure difference, boundary value problems for the flow are formulated for cases where the fluid media in the two spaces are the same perfect gas, with relatively high and low temperature (corresponding to low and high density) in the lower and upper spaces, respectively. Two separate classes of problem are distinguished. In the first, the higher pressure is in the space above the vent. This enhances the downward component of the flow from the top to the bottom space, and diminishes, or reduces to zero, the upward flow. In the second, the higher pressure is in the lower space leading to enhancement of the upward flow, etc. Relationships between the two boundary value problems and their solutions are identified. These are useful for extending an available solution for one class of problem to that of the other and for unified understanding and correlation of experimental data for the two flow configurations.

00,078
PB94-112448 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Building Environment Div.
MOIST: A PC Program for Predicting Heat and Moisture Transfer in Building Envelopes. Release 2.0.
Special pub.
D. M. Burch, and W. C. Thomas. Sep 93, 40p, NIST/SP-853.
Also available from Supt. of Docs. as SN003-003-03236-1. See also PB92-116334, PB92-170760 and PB93-166403. Prepared in cooperation with Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Mechanical Engineering.

Keywords: *Moisture content, *Heat transfer, *Buildings, *Construction materials, Walls, Roofs, Ceilings(Architecture), Computer programs, Convection, User manuals(Computer programs), *Building envelopes, MOIST computer program.

The report is a users manual for a computer program called MOIST. MOIST is a user-friendly personal computer program that predicts the one-dimensional transfer of heat and moisture in multi-layer walls, cathedral ceilings, and low-sloped roofs. The algorithms in the program predict moisture transfer in the diffusion through the capillary flow regimes. The program has a provision to account for convective moisture transfer by including embedded cavities which may be coupled to indoor or outdoor air. The user can readily include the water-vapor resistance offered by paint layers, wallpaper, and vapor retarders in simulations. The program generates a plot on the computer screen of the average moisture content of the construction layers versus time as the program executes. The program generates output files which may be imported into plotting programs for preparing reports.

00,079
PB94-113420 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Impacts: NIST Building and Fire Research Laboratory (Technical and Societal).
Special pub.
N. J. Raufaste. Aug 93, 43p, NIST/SP-838-4.
Also available from Supt. of Docs. as SN003-003-03232-8. See also PB94-110194.

Keywords: *Buildings, *Fires, *Research management, *Testing laboratories, Building codes, Fire safety, Structural engineering, Flammability testing, Standards, Computerized simulation, Construction materials, Oil spills, Navy.

The Building and Fire Research Laboratory (BFRL) of the National Institute of Standards and Technology (NIST) is dedicated to the life cycle quality of constructed facilities. The report describes major effects of BFRL's program on building and fire research. Contents: Structural Reliability; Nondestructive Testing of Concrete; Structural Failure Investigations; Seismic Design and Construction Standards; Rehabilitation Codes and Standards; Alternative Refrigerants Research; HVAC Simulation Models; Thermal Insulation; Residential Equipment Energy Efficiency; Residential Plumbing Standards; Computer Image Evaluation of Building Materials; Corrosion-Protection for Reinforcing Steel; Prediction of the Service Lives of Building Materials; Quality of Construction Materials Laboratory Testing; Roofing Standards; Simulating Fires with Computers; Fire Safety Evaluation System; Fire Investigations; Soot Formation and Evolution; Cone Calorimeter Development; Smoke Detector Standards; Standard for the Flammability of Children's Sleepwear; Smoldering Insulation Fires; Wood Heating Safety Research; In-Place Testing of Concrete; Communication

Protocols for Building Automation and Control Systems; Computer Simulation of the Properties of Concrete and Other Porous Materials; Cigarette-Induced Furniture Fires; Carbon Monoxide Formation in Enclosure Fires; Halon Alternative Fire Extinguishing Agents; Turbulent Mixing Research; Materials Fire Research; Furniture Flammability Testing; Standard for the Cigarette Ignition Resistance of Mattresses; Support of Navy Firefighter Trainer Program; and Using Fire to Clean Up Oil Spills.

Structural Analyses

00,080
PB93-125664 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Structures Div.
Measurement of Structural Deflections.
Final rept.
R. D. Marshall. 1989, 23p.
Pub. in Proceedings of Structures Congress '89, Structural Design, Analysis and Testing, San Francisco, CA., May 1-5, 1989, p904-913.

Keywords: *Structural analysis, *Sensors, *Deflections, Loads(Forces), Buildings, Dynamic response, Structural vibration, Stiffness, Bridges(Structures), Transducers, Reprints.

A basic parameter to be determined when assessing the performance of structures is the stiffness. This involves the measurement of static and/or dynamic deflections at representative locations on the structure and the measurement or estimation of the associated loads. Techniques and instrumentation in current use for the measurement of structural deflections are examined and special problems encountered with tall structures or structures with long spans are described.

00,081
PB93-161354 PC A06/MF A02
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Strengthening Methodology for Lightly Reinforced Concrete Frames-I.
L. T. Phan, D. R. Todd, and H. S. Lew. Feb 93, 111p, NISTIR-5128.

Keywords: *Framed structures, *Reinforcement(Structures), *Reinforced concrete, *Dynamic structural analysis, Concrete structures, Earthquake engineering, Dynamic response, Mathematical models, Regression analysis, Walls, Mechanical hysteresis, Stiffness, Loads(Forces), Design analysis, Deformation.

An analytical method for evaluating the inelastic dynamic structural response of lightly reinforced concrete (RC) frames strengthened by infilled shear walls was developed. The method consists of the development of hysteresis failure models for existing and strengthened RC frames and the incorporation of the models into computer program IDARC for use in analytical study. The hysteresis models were developed by, first, using the system identification techniques to characterize the load-deformation histories of fifty-five RC frame tests in terms of the stiffness degradation parameter alpha, the strength degradation parameter beta, and the pinching parameter gamma. Next, multi-variable regressions were performed to relate alpha, beta, gamma as functions of the specimen's material and geometric properties and reinforcement parameters. The results of the analyses showed that (1) hysteresis models developed using one-story, one-bay frames can be incorporated into IDARC for the analysis of frames with more than one-story height, and (2) reasonable predictions of structural behavior, both in terms of ultimate load capacity and in absorbed energy on the per cycle basis, can be achieved using the hysteresis models. Thus, in the present form, the hysteresis models can be used in parameter study to assist in the design of strengthening of RC frame structures.

00,082
PB93-206225 PC A04/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Strength of Partially-Grouted Masonry Shear Walls under Lateral Loads.
S. G. Fattal. Jun 93, 71p, NISTIR-5147.
See also PB93-206183.

Keywords: *Masonry, *Walls, *Shear tests, *Lateral pressure, Earthquake engineering, Buildings, Mathematical models, Seismic design, Cracking(Fracturing).

A proposed equation for estimating the strength of partially-grouted masonry shear walls failing in the shear mode is used to compare predicted strengths with the test results of 72 specimens obtained from three experimental programs. The results of the comparison show that predictions become less consistent with decreasing specimen strength and amount of reinforcement. Overall, predictions were within 20% of test results for 50% of the specimens. For unreinforced walls and walls in which no flexural reinforcement was used, predicted strength was less than half the measured strength. It is shown that by altering the parametric functions in the predictive equation to represent more closely post-cracking resistance mechanisms in shear walls, the correlation of predictions with experimentally-measured ultimate strength can be improved significantly.

00,083
PB93-228666 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Proceedings: ICSSC Issues Workshop. Development of Seismic Evaluation and Rehabilitation Standards for Federally Owned and Leased Buildings. Held in Denver, Colorado on September 16-17, 1992.
Oct 92, 47p, NIST/GCR-92/617.
Prepared in cooperation with Interagency Committee on Seismic Safety in Construction. Sponsored by Federal Emergency Management Agency, Washington, DC. Office of Earthquakes and Natural Hazards.

Keywords: *Federal buildings, *Seismic design, *Earthquake engineering, *Meetings, Standards, Instructions, Retrofitting, Hazards, Denver(Colorado).

The Interagency Committee on Seismic Safety in Construction (ICSSC) hosted an Issues Workshop in Denver, Colorado on September 16-17, 1992, to develop consensus resolution of issues affecting the drafting of seismic evaluation and rehabilitation standards for Federally owned and leased buildings. The development of the standards was mandated by Congress in Public Law 101-614. All potentially affected Federal agencies were invited to participate in the workshop. The report presents the proceedings of the workshop.

00,084
PB93-228674 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Guidelines and Procedures for Implementation of the Executive Order on Seismic Safety of New Construction (July 1991).
D. Todd. Jul 91, 28p, NISTIR-4635.
See also report dated Jun 92, PB92-205343. Prepared in cooperation with Interagency Committee on Seismic Safety in Construction. Sponsored by Federal Emergency Management Agency, Washington, DC. Office of Earthquakes and Natural Hazards.

Keywords: *Federal buildings, *Seismic design, Earthquake engineering, Executive orders, Safety engineering, Instructions.

Executive Order 12699, 'Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction', was signed by the President to further the goals of Public Law 95-124, the 'Earthquake Hazards Reduction Act of 1977', as amended. These guidelines and procedures for implementing the Order have been prepared and endorsed by consensus of the Interagency Committee on Seismic Safety in Construction.

00,085
PB94-101813 PC A07/MF A02
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Structures Div.
Performance of 1/3-Scale Model Precast Concrete Beam-Column Connections Subjected to Cyclic Inelastic Loads. Report No. 3.
G. S. Cheok, and W. C. Stone. Aug 93, 139p, NISTIR-5246.
See also PB91-222570. Sponsored by Concrete Research Council, Detroit, MI.

Keywords: *Precast concrete, *Construction joints, *Beams(Supports), *Cyclic loads, *Earthquake resistant structures, Concrete structures, Earthquake engineering, Failure, Ductility, Concrete construction, Model tests.

The test results of hybrid post-tensioned precast concrete beam-to-column connections (Phase IV A) are presented. These tests are part of an experimental program on 1/3-scale model precast concrete moment resisting connections being conducted at the National Institute of Standards and Technology. Previous test results are summarized. The objective of the test program is to develop guidelines for an economical precast beam-to-column connection for regions of high seismicity. The basic concept of the study is to use post-tensioning to connect the members and to eliminate the use of column corbels. Monolithic control specimens were designed to model interior moment resisting connections designed in accordance with the Uniform Building Code (ICBO, 1985 and 1988) criteria for seismic Zones 2 and 4. The precast specimens were designed to achieve moment and geometry compatibility with the monolithic design. To date, twenty specimens have been tested. Variables in the study include location of the post-tensioning steel, the use of post-tensioning bars versus strands, the use of fully and partially bonded and unbonded strands, and the combination of low strength steel and post-tensioning. Specimens were subjected to reversed cyclic loading according to a prescribed displacement history. Comparisons were made between the behavior of the precast specimens and monolithic specimens. The comparisons were based on connection strength, drift capacity of the connection, and energy dissipation characteristics.

00,086
PB94-103686 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Structures Div.
Overview of NIST Research on Seismic Performance of Moment Resisting Precast Concrete Beam-Column Joints Containing Post-Tensioning.
G. S. Cheok, and W. C. Stone. Aug 93, 40p, NISTIR-5257.

Keywords: *Precast concrete, *Earthquake damage, *Beams(Supports), *Construction joints, *Buildings, Earthquake engineering, Loads(Forces), Damage assessment, Energy dissipation, Boundary conditions, Prestressed concrete, Columns(Supports), Model tests, Cyclic loads, Ductility, Structural members, Structural analysis, Moments, Concrete structures.

The experimental test program being conducted at the National Institute of Standards and Technology on 1/3-scale model precast concrete beam-to-column connections is summarized. The objective of the test program is to develop guidelines for an economical precast beam-to-column connection for regions of high seismicity. The monolithic test specimens were interior moment resisting connections designed using the Uniform Building Code (ICBO, 1985 and 1988) criteria for seismic Zones 2 and 4 as guidelines. To date, seventeen specimens have been tested. Variables in the study include locations of the post-tensioning steel, the use of post-tensioning bars versus prestressing strands, fully bonded versus partially bonded strands, and the combination of low strength steel and post-tensioning. Specimens were subjected to reversed cyclic loading according to a prescribed displacement history. Comparisons were made between the behavior of precast specimens and monolithic specimens. The comparisons were based on connection strength, connection ductility, and energy dissipation characteristics.

BUSINESS & ECONOMICS

General

00,087
PB93-179968 PC A14/MF A03
National Inst. of Standards and Technology (TS), Gaithersburg, MD. Office of Standards Services.

Proceedings of the Meeting of the Intergovernmental U.S.-Russian Business Development Committee's Standards Working Group (2nd). Held in Gaithersburg, Maryland on March 23-24, 1993.
Internal rept.
S. I. Warshaw. Apr 93, 303p, NISTIR-5166.

Keywords: *International cooperation, *Standardization, *USSR, *USA, *Meetings, Recommendations, Certification, Standards, Conformity assessment, US NIST, GOSSTANDART.

The 1992 U.S. - Russia Summit in Washington DC marked the beginning of a new commercial relationship between the United States and Russia. Additionally, the U.S. Secretary of Commerce and the Russian Minister of Foreign Economic Relations established an 'Intergovernmental U.S. - Russian Business Development Committee' to solve problems, promote trade development activities and serve as the forum to assist in such trade related matters as standardization and conformity assessment matters. The Standards Working Group of the Committee held its first meeting in St. Petersburg, Russia, September 8 - 9, 1992. The recommendations resulting from that first meeting are appended to the report. The second meeting of the Standards Working Group resulted in an exchange of information regarding the standards and conformity assessment practices of each country and an understanding of new standards related legislative initiatives within Russia. Of particular significance was the signing of a formal Memorandum of Understanding for cooperation on standards, certification, testing, and metrology matters between the United States (NIST) and Russia (GOSSTANDART). It was also the first public announcement of a new United States Department of Commerce initiative to provide financial support to Russians desiring to learn more about U.S. standardization practices within industrial and commercial enterprises.

00,088
PB93-188969 PC A03/MF A01
National Inst. of Standards and Technology (TS), Gaithersburg, MD. Metric Program.
Metrication: An Economic Wake-up Call for U.S. Industry.
G. P. Carver. Mar 93, 16p, NISTIR-5154.
See also PB92-222249.

Keywords: *Metric system, *International system of units, *Standards, Government policies, Economic impact, Benefit cost analysis, Measurement, Industries, USA, *Foreign technology, *Metrication.

As the international standard of measurement, the metric system is one key to success in the global marketplace. International standards have become an important factor in international economic competition. Non-metric products are becoming increasingly unacceptable in world markets that favor metric products. Procurement is the primary federal tool for encouraging and helping U.S. industry to convert voluntarily to the metric system. Besides the perceived unwillingness of the customer, certain regulatory language, and certain legal definitions in some states, there are no major impediments to conversion of the remaining non-metric industries to metric usage. Instead, there are good reasons for changing, including an opportunity to rethink many industry standards and to take advantage of size standardization. Also, when the remaining industries adopt the metric system, they will come into conformance with federal agencies engaged in similar activities.

Domestic Commerce, Marketing, & Economics

00,089
PB93-139129 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Precision Engineering Div.
Federal Move to Metric: Public Law, DoC and NIST.
D. A. Swyt. Dec 92, 14p, NISTIR-4761.

Keywords: *International system of units, *Metric system, *Law(Jurisprudence), Government policies, Historical aspects, Metrication, Metrology, US DOC, Department of Commerce, US NIST.

Since its initial development, the metric system of measurement has evolved to become the modern International System of Units (SI) and been formally accepted by all the nations of the world save three and all the industrialized nations save one, the United States. Recently, Congress passed the Metric Usage Act of 1988, requiring all Federal agencies, including the National Institute of Standards and Technology, to plan and implement conversion to use of metric in their business-related activities and assigned responsibility for coordination of Federal agency conversion to the Department of Commerce. This paper reviews briefly the Federal legislative history of metric use in the U.S., metric practice associated with the modernized system, and the policies and plans of the Federal government in its legislatively-mandated conversion to use of that system.

00,090
PB93-152080 PC A03/MF A01
National Inst. of Standards and Technology (TS), Gaithersburg, MD. Standards Code and Information Program.
Questions and Answers on Quality, the ISO 9000 Standard Series, Quality System Registration, and Related Issues.
M. Breitenberg. Jul 92, 25p, NISTIR-4721.
Also available from Supt. of Docs. See also PB92-126465.

Keywords: *Test facilities, *International trade, *Standards, *Quality assurance, United States, Assessments, Reliability, Requirements, Specifications, *Registration, European community, ISO 9000 Series.

The report provides information on the development, content and application of the ISO 9000 standards to readers who are unfamiliar with these aspects of the standards. It attempts to answer some of the most commonly asked questions on quality; quality systems; the content, application and revision of the ISO 9000 standards; quality system approval/registration; European Community requirements for quality system approval/registration; and sources for additional help.

00,091
PB93-160588 PC A20
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD.
Measurements for Competitiveness in Electronics. First Edition.
Apr 93, 473p, NISTIR-4583.

Keywords: *Competition, *Electronics industry, *Measurement, Marketing, Research and development, Integrated circuits, Fiber optics, Microwave equipment, Laser applications, Communication equipment.

U.S. industry is experiencing a major shortfall in the measurement capability needed for competitiveness in electronic products. The document identifies the measurement needs that are most critical to U.S. competitiveness, that would have the highest economic impact if met, and that are the most difficult for the broad range of individual companies to address. The measurement needs are reviewed for nine important fields of electronics, including semiconductors, magnetics, superconductors, microwaves, lasers, optical-fiber communications, optical-fiber sensors, video, and electromagnetic compatibility. These fields of electronics underlie more than $300 billion of electronic and electrical products manufactured in the U.S. each year. The assessment provides the framework for an action plan to correct the shortfall in U.S. measurement capability in electronics and to advance U.S. competitiveness.

00,092
PB93-206886 PC A03/MF A01
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Molecular Physics Div.
Collection of Successful Interactions between the MTCs and Client Firms.
Final rept.
R. D. Suenram. Mar 93, 33p, NIST/SP-848.
Also available from Supt. of Docs. as SN003-003-03206-9.

Keywords: *Manufacturing, *Productivity, *Technology transfer, Competition, United States, Assistance, Case studies, Small businesses, Computer aided design, Computer aided manufacturing, Economic analysis, Automation, Commercialization, *MTC(Manufacturing Technology Centers), NIST(National Institute of Standards and Technology), ISO(International Organization for Standardization).

The Omnibus Trade and Competitiveness Act of 1988 established the Manufacturing Technology Centers (MTC) program as a new initiative at the National Institute of Standards and Technology (NIST). The charge of the program is to contribute toward improved U.S. industrial productivity and competitiveness in the growing international marketplace with a focus on assistance to the small-to-medium sized manufacturing firms in this country. The publication contains a collection of interesting interactions that have transpired between the first five MTCs and a number of their client firms.

International Commerce, Marketing, & Economics

00,093
PB93-140689 PC A04/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
More Questions and Answers on the ISO 9000 Standard Series and Related Issues.
M. Breitenberg. Feb 93, 54p, NISTIR-5122.
See also PB92-126465 and PB93-152080.

Keywords: *International trade, *Standards, *Test facilities, *Quality assurance, Quality control, Assessments, Reliability, Inspection, Specifications, *ISO 9000 Standard Series, ISO(International Organization for Standardization), Registration, National Institute of Standards and Technology.

The report, a sequel to NISTIR 4721 (PB92-126465), provides additional information on the ISO 9000 standards and related issues to readers unfamiliar with some of the new developments in the area. It attempts to answer additional questions on ISO 9000 standards related issues which the National Institute of Standards and Technology (NIST) has received since the publication of NISTIR 4721. It also identifies sources for further help in this area.

00,094
PB93-170900 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Program for Conformity Assessment System Evaluation: Analysis of Comments on the NIST Proposal.
J. L. Donaldson, and P. W. Cooke. Mar 93, 45p, NISTIR-5138.

Keywords: *Program evaluation, Certification, Accreditation, Regulations, Global, Testing, International trade, Guidelines, Recognition, Tables(Data), *National Institute of Standards and Technology, *CASF(Conformity Assessment System Evaluation).

The National Institute of Standards and Technology (NIST) proposed the establishment of a voluntary Conformity Assessment System Evaluation (CASE) program in a Federal Register Notice in March 1992. CASE would enable the Department of Commerce, acting through NIST, to provide assurances to foreign entities that designated U.S. conformity assessment activities satisfy international guidelines. Public comments on the proposal were requested and 173 responses were received. Review and analysis of these comments indicates a desire for NIST to provide recognition of privately operated accreditation programs, although considerable support can also be seen for NIST to provide both accreditation and recognition.

CHEMISTRY

General

00,095
PB93-191427 PC A02/MF A01
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

General

Two New Gas Standards Programs at the National Institute of Standards and Technology.
W. J. Mitchell, and W. E. May. Apr 93, 8p, EPA/600/A-93/107.
See also PB82-162876. Presented at the Environmental Protection Agency/Air and Waste Management Association, 1993 Symposium on 'Measurement of Toxic and Related Air Pollutants', Durham, NC., May 3-7, 1993. Sponsored by National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Organic Analytical Research Div.

Keywords: *Standards, *Gases, *Air pollution monitors, Calibrating, Performance evaluation, US EPA, Regulations, Concentration(Composition), Agreements, Comparison, *NIST Traceable Reference Materials, *Research Gas Mixture, Certified Reference Materials Program, Standard reference materials.

The EPA/NIST certified reference materials (CRM) program is being terminated and replaced with two new ones: the NIST Traceable Reference Materials (NTRM) and the Research Gas Mixture (RGM) programs. These new programs are being implemented to provide NIST traceability to a wider number of gas mixtures. The NTRM program will differ from the CRM program in two significant ways: Candidate gas mixtures will not have to be identical to a NIST Standard Reference Material (SRM), and the producer of the NTRM rather than EPA will pay NIST to check the concentration of the gas mixture. In the RGM program, NIST will enter into agreements with either governmental, commercial or private organizations to produce gas mixtures for which there are no SRMs or which lie outside the concentration range of existing SRMs. The details of these programs are presented in the paper.

Analytical Chemistry

00,096
PB93-100063 PC$75.00/MF A02
Teknekron Sensor Development Corp., Menlo Park, CA.
Opportunities for Innovation: Chemical and Biological Sensors.
M. Madou, and J. P. Joseph. Oct 91, 147p, NIST/GCR-91/593-1.
Grant 60NANB9D0980
Supersedes PB92-127315. Sponsored by National Inst. of Standards and Technology, Gaithersburg, MD.

Keywords: *Technology innovation, *Sensors, *Bioinstrumentation, *Chemical compounds, Technology transfer, Industry, Manufacturing, Design criteria, Performance evaluation, Monitors, Chemical analysis, Solid state devices, Measuring instruments, Marketing, Biological materials, Acoustic measuring instruments, Electrochemistry, Gas detectors, National Institute of Standards and Technology.

The series of NIST monographs called 'Opportunities for Innovation' has been conceived with the small, technology based company in mind. Each monograph provides the technical staff of a small firm with a multicompany report on the best opportunities for new business endeavors in a technology driven market. The present volume in this series, 'Chemical and Biological Sensors', continues in the same vein. The field is full of fledgling, mostly privately held companies looking for markets in the chemical and processing industries, in the automotive and power generating industries, and in the health care industry. At the same time, users of industrial sensors have expressed disappointment in the lack of interest shown by sensor manufacturers in their specific needs. There is a need for more well-planned contacts between sensor manufacturers and those who use them. The Opportunities for Innovation program is designed to assist in the process.

00,097
PB93-125623 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Gas and Particulate Science Div.
Preparation and Preliminary Analysis of K-411 Glass Microspheres.
Final rept.
R. B. Marinenko, J. A. Small, D. H. Blackburn, D. R. Retorick, and N. J. Shire. 1989, 3p.
Pub. in Microbeam Analysis 24, p254-256 1989.

Keywords: *Microspheres, *Electron microprobe analysis, *Microanalysis, Particulates, Reprints, Glass standards, Standard reference materials.

The preliminary electron microprobe analysis of a batch of glass microspheres is described. The mounted, polished, cross sections of the spheres were compared to the bulk glass, k-411, with two different instruments using energy dispersive spectrometry. Normalized results of these analysis showed that the two instruments provided consistent results which closely agrees with the bulk material within a +10 percent error. The microspheres are being evaluated for eventual Standard Reference Materials (SRM) certification.

00,098
PB93-125854 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
New Method for Phase Identification for Electron Diffractionists.
Final rept.
A. D. Migheli, and V. L. Himes. 1990, 5p.
Pub. in Jnl. of Electron Microscopy Technique 16, n2 p155-159 1990.

Keywords: *Electron microscopy, Chemical analysis, Chemical composition, Crystal lattices, Electron diffraction, Reprints, Phase identification.

An accurate analytical procedure for phase identification for electron diffractionists has been developed. The method opens new frontiers in the identification of solid-state materials as crystalline samples in the size range 10 micrometers to 10 A can be accurately characterized. Research with NIST CRYSTAL DATA (a large database with chemical, physical and crystallographic data on solid-state materials) has proved that a material can be uniquely characterized on the basis of its lattice and chemical composition. To characterize a material, it is sufficient to determine any primitive cell of the lattice and the element types present. Using a modern analytical electron microscope (AEM), the experimentalist can collect the required data on an unknown sample. The lattice information is obtained by rotation of the sample to obtain two planes of data. From these planes, a unit cell defining the lattice can be deduced. The chemical data is determined by energy dispersive spectroscopy (EDS). Once the experimental data are measured, the unknown is identified against the database of knowns using lattice/element-type matching techniques. The basic strategy consists of three steps. Experience has proved that the procedure is highly selective and reliable.

00,099
PB93-151660 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Biotechnology Div.
Surface-Enhanced Raman Study of Benzylpenicillin.
Final rept.
V. Reipa, and J. J. Horvath. 1992, 5p.
Pub. in Applied Spectroscopy 46, n6 p1009-1013 Jun 92.

Keywords: *Raman spectra, *Penicillins, *Molecular structure, Reprints, Silver electrodes, Benzylpenicillin.

The surface-enhanced Raman spectra (SERS) of benzylpenicillin on electrochemically roughened Ag electrodes were investigated. Spectral assignments were carried out. Comparison with powder Raman spectra demonstrated that the benzene ring is in a vertical position relative to the surface. The molecule is bonded to the silver surface through the carboxylate group and the tertiary nitrogen of the beta-lactam ring, resulting in formation of a bidentate surface complex. Evidence of partial benzylpenicillin hydrolysis into 6-aminopenicillanic acid and phenylacetic acid on the surface of the electrode is presented. No indication of electrochemical reactions was observed in the potential range from -1.2 to +0.3 V.

00,100
PB93-151686 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Gas and Particulate Science Div.
Multi-Point Calibration of a Gas Chromatograph Using Cryogenic Preconcentration of a Single Gas Standard Containing Volatile Organic Compounds.
Final rept.
G. C. Rhoderick, and W. R. Miller. 1990, 6p.
Pub. in Analytical Chemistry 62, n8 p810-815 1990.

Keywords: *Gas chromatography, *Volatile organic compounds, *Concentrating, *Cryogenics, Calibrating, Standards, Concentrators, Trapping, Reprints, *Cryogenic preconcentration.

Methodology is described for the use of a cryogenic preconcentration technique to increase the sample amount of trace volatile toxic organic compounds in a gas matrix for analysis by a gas chromatograph (GC). A GC equipped with a flame-ionization detector (FID) was set up for the analysis of such gas mixtures in a nitrogen balance gas. A system was assembled to preconcentrate cryogenically the gas sample and then inject it onto the chromatographic column. The system was evaluated for analytical precision and to determine if it could be used to construct a calibration curve for the instrument using a single calibration gas standard. An experiment was also performed to determine the trapping efficiency of the organic compounds using the system as constructed. The operating procedure evaluated for cryogenically preconcentrating the sample involved the trapping of the sample for different time intervals at a set sample flow rate. The analytical data from this procedure was plotted for each compound in the gas standard using linear forced zero regression. Results indicate that the method is very linear over the range of operating conditions studied. This determination of linearity now allows the use of one calibration gas standard to develop a calibration range for an instrument.

00,101
PB93-151967 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Organic Analytical Research Div.
Specimen Banking at the National Institute of Standards and Technology.
Final rept.
R. Zeisler, B. J. Koster, and S. A. Wise. 1992, 13p.
See also PB89-175855.
Pub. in Analytical Approaches as Related to Specimen Banking, Chapter 3, p37-49 1992.

Keywords: *Sample preparation, *Environmental monitoring, *Analytical techniques, *Chemical analysis, Storage, Long term effects, Feasibility studies, Bioassay, Marine environments, Humans, Trends, Pollutants, Blood analysis, Reprints, *National Institute of Standards and Technology, *Specimen banking.

More than twelve years of practical experience in specimen banking at the National Institute of Standards and Technology (NIST), within the National Biomonitoring Specimen Bank (NBSB), have demonstrated that the concept of long-term storage of environmental specimens is feasible. The activities at NIST include specimen banking of: human liver samples, samples from the marine environment (sediments, oysters, mussels, fish tissue and marine mammal tissues), human serum, and total human diet samples. These research projects are associated with several different U.S. government environmental programs. The NBSB is providing a wide range of know-how in the collection, processing, long-term storage, and analysis of the different samples types. Even though the types of specimens and the number of samples collected are limited, the NBSB can serve as a valuable resource for the assessment of long-term trends of pollutants and for future retrospective studies. Specimens can be made available to the scientific community and national or international organizations.

00,102
PB93-153781 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Electron and Optical Physics Div.
Resonance Ionization Spectroscopy/Resonance Ionization Mass Spectrometry Data Service. I-Data Sheets for As, B, Cd, C, Ge, Au, Fe, Pb, Si, and Zn.
Final rept.
E. B. Saloman. 1990, 47p.
See also PB91-162297 and PB91-203968.
Pub. in Spectrochimica Acta 45B, n1/2 p37-83 1990.

Keywords: *Resonance ionization mass spectroscopy, *Chemical analysis, Analytical chemistry, Ionization cross sections, Photoionization, Arsenic, Boron, Cadmium, Carbon, Germanium, Gold, Iron, Lead(Metal), Silicon, Zinc, Reprints, *Resonance ionization spectroscopy, Data service.

A data service is being established at the National Institute of Standards and Technology to provide the necessary information to apply the techniques of resonance ionization spectroscopy (RIS) and resonance ionization mass spectrometry (RIMS) to routine use in

analytical chemistry. This service will collect and calculate the relevant atomic data, choose appropriate resonance ionization schemes, and indicate pertinent operating details of successful RIMS studies. The first group of data sheets is included, covering the elements As, B, Cd, C, Ge, Au, Fe, Pb, Si and Zn. Others will be published periodically. Reprints of RIS/RIMS work are solicited so that those efforts may be included in future data sheets.

00,103
PB93-153799 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Organic Analytical Research Div.
Subambient Temperature Modification of Selectivity in Reversed-Phase Liquid Chromatography.
Final rept.
L. C. Sander, and S. A. Wise. 1989, 6p.
Pub. in Analytical Chemistry 61, n15 p1749-1754 1989.

Keywords: *Liquid column chromatography, *Extraction columns, *Aromatic polycyclic hydrocarbons, *Temperature effects, *Selectivity, Surface properties, Thermodynamics, Adsorption, Reprints, Retention theory.

The effect of column temperature on selectivity was studied for the separation of polycyclic aromatic hydrocarbon (PAH) mixtures. Two commercial columns prepared using monomeric and polymeric surface modification chemistry were employed. Selectivity was evaluated through the use of a three component PAH mixture previously developed for phase type evaluation. Column selectivity was found to vary continuously with temperature, regardless of the type of phase used. The shape recognition ability of each phase, i.e., the ability of the phase to separate closely related isomers, was observed to be highest at subambient temperatures. A model for the temperature induced selectivity changes is proposed based on the morphology of the bonded phase.

00,104
PB93-166494 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Inorganic Analytical Research Div.
Laser-Enhanced Ionization Spectrometry Following Matrix Modification by Automated Chelation Chromatography for the Analysis of Biological and Environmental Reference Materials.
Final rept.
G. C. Turk, and H. M. Kingston. 1990, 7p.
Pub. in Jnl. of Analytical Atomic Spectrometry 5, n7 p595-601 1990.

Keywords: *Laser spectroscopy, *Chemical analysis, Trace elements, Chromatographic analysis, Chelation, Environmental materials, Bioassay, Reprints, *Laser enhanced ionization, Standard reference materials.

Trace metal analysis of biological and environmental materials by laser-enhanced ionization (LEI) spectroscopy is hampered by measurement interferences caused by the high levels of alkali and alkaline earth elements in such samples. The characteristics of these interferences are described, and the use of automated chelation chromatography to remove the interfering elements from samples prior to analysis is demonstrated. This procedure was applied to the LEI analysis of six Standard Reference Materials (SRMs), including: trace metals in water (SRM 1643b), buffalo river sediment (SRM 2704), bovine serum (SRM 1598), total diet (proposed SRM 1548), apple leaves (proposed SRM 1515), and peach leaves (proposed SRM 1547). The improved measurement performance of LEI following automated chelation chromatography is described.

00,105
PB93-166502 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Inorganic Analytical Research Div.
Topics in Laser Spectroscopy - Simultaneous Detection of Laser-Enhanced Ionization and Laser-Induced Fluorescence in Flames - Noise Correlation Studies.
Final rept.
G. C. Turk, and J. C. Travis. 1990, 11p.
Pub. in Spectrochimica Acta 45, n4-5 p409-419 1990.

Keywords: *Laser induced fluorescence, *Laser spectroscopy, *Flame spectroscopy, Pulsed lasers, Excited states, Sodium, Noise, Correlation, Reprints, *Laser enhanced ionization.

Simultaneous measurements of pulsed Laser-Enhanced Ionization (LEI) and Laser-Induced Fluorescence (LIF) of sodium in a flame were performed. Excitation line profiles were found to be identical and a strong correlation between the noise of the two signals was found. The possibility of correcting for spectrally broadband background signals encountered in LEI spectroscopy by monitoring the LIF signal from the interfering element is demonstrated. The correlation between the noise of the two measurements results in some reduction of noise when the background correction is applied.

00,106
PB93-166908 (Order as PB93-166817, PC A08)
National Inst. of Standards and Technology, Gaithersburg, MD.
Prompt-Gamma Activation Analysis.
R. M. Lindstrom. 1993, 7p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n1 p127-133 Jan/Feb 93.

Keywords: *Activation analysis, Neutron capture gamma rays, Prompt gamma radiation, Nondestructive analysis, Chemical analysis, Cold neutrons, Gamma detection, Fullerenes, Hydrogen, Uses, CNRF facility.

A permanent, full-time instrument for prompt-gamma activation analysis is nearing completion as part of the Cold Neutron Research Facility (CNRF). The design of the analytical system has been optimized for high gamma detection efficiency and low background, particularly for hydrogen. Because of the purity of the neutron beam, shielding requirements are modest and the scatter-capture background is low. As a result of a compact sample-detector geometry, the sensitivity (counting rate per gram of analyte) is a factor of four better than the existing Maryland-NIST thermal-neutron instrument at the reactor. Hydrogen backgrounds of a few micrograms have already been achieved, which promises to be of value in numerous applications where quantitative nondestructive analysis of small quantities of hydrogen in materials is necessary.

00,107
PB93-183796 PC A06/MF A02
National Inst. of Standards and Technology (TS), Gaithersburg, MD. Standard Reference Materials Program.
Standard Reference Materials: Handbook for SRM Users.
Special pub.
J. K. Taylor, and N. M. Trahey. Feb 93, 122p, NIST-SP-260-100-ED-1993.
Supersedes PB86-110897. Also available from Supt. of Docs. as SN003-003-03205-1.

Keywords: *Handbooks, Chemical analysis, Quality assurance, Measurement, Calibration, Uncertainty, Precision, Accuracy, Control charts, Metrology, Uses, *Standard reference materials, Statistical control.

The handbook was prepared to provide guidance for the use of Standard Reference Materials (SRMs) to provide an accuracy base for chemical measurements. The general concepts of precision and accuracy, and their realization by quality assurance of the measurement process, are discussed. General characteristics of SRMs are described and guidance given on their selection for specific applications. Ways to effectively use SRMs are recommended, including the utilization of control charts to evaluate and monitor measurement accuracy. Appendices provide statistical guidance on the evaluation of measurement uncertainty.

00,108
PB94-113081 PC A03/MF A01
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Large Scale Evaluation of a Pattern Recognition/Expert System for Mass Spectral Molecular Weight Estimation.
Journal article (Final).
D. R. Scott, A. Levitsky, and S. E. Stein. 1993, 13p, EPA/600/J-93/465.
Pub. in Analytica Chimica Acta, v278 p137-147 1993. Prepared in cooperation with National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Chemical Kinetics and Thermodynamics Div.

Keywords: *Mass spectroscopy, *Pattern recognition, *Organic compounds, *Expert systems, *Molecular weight, Spectrum analysis, Statistical analysis, Volatile organic compounds, Reprints.

A fast, personal-computer based method of estimating molecular weights of organic compounds from low resolution mass spectra has been thoroughly evaluated. The method is based on a rule-based pattern recognition/expert system approach which uses empirical linear corrections which are iteratively applied to two mass spectral features to yield estimates. This technique has been extensively evaluated with 400 spectra of volatile and nonvolatile compounds of environmental and pharmaceutical interest and with 31378 high quality NIST reference spectra of compounds of molecular weight 30-500. For both sets of evaluation spectra the median and average absolute deviations were 1.5-2.0 and 13-17 daltons, respectively. Median errors for spectra with the molecular ion present were ca. twenty times lower than those without the molecular ion. The present system can rapidly produce molecular weight estimates of a wide variety of compounds with median absolute errors of 2 (average 15) daltons. Results with the 106 toxic and related training compounds show a median and average absolute deviation of 0 and 0.6 daltons.

00,109
PB94-113578 PC A02/MF A01
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Surface and Microanalysis Science Div.
Airborne Asbestos Method: Standard Test Method for Verified Analysis of Asbestos by Transmission Electron Microscopy. Version 1.0.
S. Turner, and E. B. Steel. Sep 93, 10p, NISTIR-5276.
Sponsored by Environmental Protection Agency, Washington, DC.

Keywords: *Asbestos, *Chemical analysis, *Transmission electron microscopy, Performance evaluation, Comparison, Air pollution detection, Water pollution detection, Procedures, Quality assurance, Quality control, Standards, *Verified analysis.

The analysis of asbestos by transmission electron microscopy is important for determination of the cleanliness of air or water and for research purposes. Verified analysis provides a method for determining the quality of the analyses. Verified analysis is a procedure in which a grid opening is independently analyzed for asbestos by two or more transmission electron microscope (TEM) operators and in which a comparison and evaluation of the correctness of the analyses are made by a verifying analyst. Detailed information -- including absolute or relative location, a sketch, orientation, size (length, width), morphology, analytical information and structure identification -- is recorded for each observed asbestos structure. Comparisons of the analyses are made on a structure-by-structure basis and the percentage of true positives, false positives and false negatives are determined for each TEM operator. Verified analyses can be used as part of a quality assurance program for asbestos analyses and as a training procedure. The report describes a method for conducting a verified analysis. The method is reported in ASTM format.

Industrial Chemistry & Chemical Process Engineering

00,110
AD-A266 615/4 PC A03/MF A01
National Inst. of Standards and Technology, Boulder, CO.
Transient Hydrogen Heat Transfer.
Final rept. Apr 86-Apr 89.
B. Louie, and W. G. Steward. 1 Aug 90, 42p, WRDC-TR-90-2070.

Keywords: *Heat transfer, *Liquid hydrogen, *Nucleate boiling, Carbon, Coefficients, Film boiling, Thin films, Platinum, Foils(Materials), Power levels, Resistance, Temperature coefficients.

The Chemical Engineering Science Division (Boulder CO) of the National Institute of Standards and Technology has investigated transient heat transfer to liquid hydrogen. Thin carbon films and Pt foils submerged in liquid hydrogen received stepped inputs of power of 1 to 42 W/ sq cm, and the onset of nucleate or film boiling was obtained for each power level. The critical heat flux was found to be approximately 8 W/sq cm, with the transition to film boiling occurring in times less than

10(exp-3). Premature film boiling can be related to the positive temperature coefficient of resistance and the narrowness of the heaters. Thermometric devices and power generation equipment selection are discussed.... Liquid hydrogen heat transfer, Nucleate boiling onset.

00,111
PB93-153658 Not available NTIS
National Inst. of Standards and Technology (CSTL), Boulder, CO. Chemical Engineering Div.
Measurement of the Performance of a Spiral Wound Polyimide Regenerator in a Pulse Tube Refrigerator.
Final rept.
W. Rawlins, K. D. Timmerhaus, R. Radebaugh, and D. E. Daney. 1992, 7p.
Sponsored by National Aeronautics and Space Administration, Moffett Field, CA. Ames Research Center.
Pub. in Advances in Cryogenic Engineering, v37 p947-953 1992.

Keywords: *Polyimide resins, *Regeneration(Engineering), *Cooling systems, *Cryogenics, Numerical analysis, Performance evaluation, Reprints, *Pulse tube refrigerators.

A regenerator for use in a pulse tube refrigerator has been constructed from a polyimide (polypyromellitimide or PPMI) whose small ratio of thermal conductivity to heat capacity make it a good candidate for a regenerator material in cryocoolers. The regenerator was fabricated using 25 micrometer thick photoresist strips bonded to a 50 micrometer thick sheet of PPMI. This composite sheet was wound in jelly-roll fashion around a mandrel and inserted into the regenerator housing. The photoresist strips, formed using a photolithographic technique, provided a 25 micrometer spacing for the axial flow of gas between each layer of PPMI. Ineffectiveness results are presented for this material under actual operating conditions in a pulse tube refrigerator and compared with a numerical model. The numerical model indicated that a polyimide regenerator would perform much better than one constructed of stainless steel screen, but the experimental results showed the opposite behavior. Measured values for the ineffectiveness were 0.003 for the stainless steel screen and 0.017 for the polyimide.

00,112
PB93-166056 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Chemical Process Metrology Div.
Model Studies of SnO2-Based Gas Sensors: Vacancy Defects and Pd Additive Effects.
Final rept.
S. Semancik, and T. B. Fryberger. 1990, 6p.
See also PB91-203075.
Pub. in Sensors and Actuators **B**1, n1-6 p97-102 1990.

Keywords: *Gases, *Sensor characteristics, *Tin oxides, *Oxide coatings, Crystal defects, Palladium, Oxygen, Hydrogen, Detectors, Additives, Anodic coatings, Reprints, Surface analysis.

Surface analytical techniques including X-ray and UV photoemission spectroscopies (XPS, UPS), ion scattering spectroscopy (ISS) and in situ four-point conductance measurements have been used to carry out model studies of tin oxide (SnO2) based gas-sensing processes. Specific results presented here involve the interfacial properties of pure and Pd-dosed SnO2(110) crystals, both in vacuum and following adsorption of oxygen and hydrogen. Emphasis has been placed on experiments that isolate particular mechanistic effects and attempt to evaluate their relative importance in producing a sensing response.

00,113
PB93-166346 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Chemical Process Metrology Div.
Mechanistic and Response Studies of Iridium Oxide pH Sensors.
Final rept.
M. J. Tarlov, S. Semancik, and K. G. Kreider. 1990, 5p.
Pub. in Sensors and Actuators **B** 1, n1-6 p293-297 1990.

Keywords: *pH, *Sensor characteristics, *Iridium oxides, *Oxide coatings, Anodic coatings, Detectors, Sputtering, Sensitivity, Reprints, Surface analysis.

Results are presented on the pH-potential response of d.c. magnetron reactively sputtered iridium oxide films. Freshly deposited films exhibit a nearly Nernstian response to pH and little hysteresis. The redox sensitivity of films prepared by sputtering in water-saturated oxygen and annealed in an oxygen atmosphere has been examined. In addition, methods are described for preparing model iridium oxide sensor surfaces for ultra-high vacuum surface analytical studies. Stoichiometric IrO2-like surfaces are shown to be relatively inert to gas phase water. Hydroxylation of IrO2-like surfaces can be induced by rf water plasma treatment.

Photochemistry and Radiation Chemistry

00,114
PB93-149128 Not available NTIS
Logicon R and D Associates, Los Angeles, CA.
Franck-Condon Factors, r-Centroids, Electronic Transition Moments, and Einstein Coefficients for Many Nitrogen and Oxygen Band Systems.
F. R. Gilmore, R. R. Laher, and P. J. Espy. c1992, 103p.
Prepared in cooperation with Defense Group, Inc., Santa Monica, CA., and Utah State Univ., Logan. Center for Space Engineering.
Included in Jnl. of Physical and Chemical Reference Data, v21 n5 p1005-1107 Sep/Oct 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Nitrogen, *Oxygen ions, *Fluorescence, *Spectral bans, *Photochemical reactions, *Oxygen, Auroras, Franck-Condon principle, Energy-level transitions, Centroids, Electron transitions, Einstein equations, Nuclear explosions, Electron guns, Potential energy, Atmospheric chemistry, Rydberg Klein Rees method.

Air fluorescence models require accurate Franck-Condon factors and Einstein coefficients for analyzing the intensities of N2, N2(+), and O2(+) emissions produced by electron bombardment of air, such as in the aurora, high-altitude nuclear explosions, and rocket-borne electron gun experiments. In the previous report, improved vibrational and rotational constants based on the latest available spectroscopic measurements for several excited and ionic states important in air fluorescence modeling were derived. These constants have been used in the present work to calculate band origins, Franck-Condon factors, and r-centroids for many band systems of nitrogen and oxygen. In the report, tables of band origin wave-lengths and wavenumbers, Franck-Condon factors, r-centroids, electronic transition moments, and Einstein coefficients are presented for 17 N2, N2(+), and O2(+) band systems.

00,115
PB93-150829 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Biotechnology Div.
Observation of Photon Correlations in Scattering from a Silver Electrode.
Final rept.
A. K. Gaigalas, and V. Reipa. 1992, 12p.
Pub. in Jnl. of Electroanaly. Chem. 328, p99-110 1992.

Keywords: *Silver, *Electrodes, *Light scattering, Surface properties, Surface roughness, Photons, Reprints.

Dynamic light scattering experiments were carried out on silver electrodes in aqueous solution. Two distinct time-scales were observed in the photon autocorrelation function: 1 ms and 100 ms. The 1 ms decay in the correlation was predominant during voltage cycling, while the slow decay is present at all times in varying strength. A possible source of the fast correlation is the generation of dynamic polarizability inhomogeneities on the silver surface, while the slow correlation is associated with microscopic surface height modulation during electrocrystallization.

Physical & Theoretical Chemistry

00,116
AD-A263 817/9 Not available NTIS
National Inst. of Standards and Technology, Gaithersburg, MD.
Vibrational Spectra of Molecular Ions Isolated in Solid Neon. X. H2O(+), HDO(+), and D2O(+).
D. Forney, M. E. Jacox, and W. E. Thompson. 1993, 10p, ARO-30094.2-CH.
Pub. in J. Chemical Physics, v98, n2, p841-849 Jan 93.

Keywords: *Molecular Ions, *Molecular properties, *Vibrational spectra, *Water, Neon, Infrared spectroscopy, Near infrared radiation, Isotopes, Photoionization, Reprints.

When a Ne:H2O>200 sample is codeposited at approximately 5 K with a beam of neon atoms that have been excited in a microwave discharge, new infrared absorptions appear close to the gas-phase band centers of the three vibrational fundamentals of H2O(+). Detailed isotopic substitution studies confirm this assignment and provide assignments for all of the vibrational fundamentals of HDO(+) and D2O(+). When ions are present in the neon matrix, rotation of a significant fraction of the water molecules in inhibited. Electrons produced by the photodetachment of anions, which must be present to maintain overall charge neutrality of the deposit, accelerate nuclear spin equilibrium of water in the matrix. As the concentration of H2O(+) is decreased by capture of the photodetached electrons, the absorptions assigned to nonrotating water are also reduced in intensity. The nature of the other ionic species which may be present in the sample is considered.

00,117
AD-A263 966/4 Not available NTIS
National Inst. of Standards and Technology, Gaithersburg, MD.
Mid- and Near-Infrared Spectra of Water and Water Dimer Isolated in Solid Neon.
D. Forney, M. E. Jacox, and W. E. Thompson.
c1993, 16p, ARO-30094.1-CH.
Contract MIPR-12493
Availability: Pub. in Jnl. of Molecular Spectroscopy, v157 p479-493 1993. Available only to DTIC users. No copies furnished by NTIS.

Keywords: *Nuclear spins, *Water, *Infrared spectra, Deuterium, Excitation, Molecules, Oxygen, Rare gases, Ratios, Rotation, Spectra, Reprints, Hydrogen, Solid neon.

Spectra have been obtained between 700 and 8000 /cm for H2 (16)O, and between 700 and 5000 /cm for deuterium and/or oxygen-18-enriched water, trapped in solid neon at approximately 5 K. Samples with Ne:water mole ratios between 400 and 6400 were studied. As in the heavier rare-gas solids, isolated water molecules can undergo relatively free rotation in solid neon, and nuclear spin equilibration is slow. The observed spectra can be explained by postulating excitation from the two lowest rotational levels of the water molecule. Absorptions of nonrotating water are also present in the spectrum. The matrix shifts for water isolated in a neon matrix are much smaller than those reported for water in matrices of the heavier rare gases. Absorptions contributed by the H- or D-donor moiety of (H2O)2, (HDO)2, and (D2O)2 have also been identified and assigned.

00,118
DE93019442 PC A03/MF A01
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Thermophysics Div.
Development of Measurement Capabilities for the Thermophysical Properties of Energy-Related Fluids. Annual Report, December 1, 1992--November 30, 1993.
Progress rept.
R. F. Kayser. 13 Aug 93, 23p, DOE/ER/13823-T1.
Contract AI05-88ER13823
Sponsored by Department of Energy, Washington, DC.

Keywords: *Fluids, Physical Properties, Calorimeters, Densimeters, Dielectric Properties, Dilution, Equilibrium, Lubricants, Measuring Instruments, Mixtures, Phase Studies, Progress Report, Refrigerants, Solutions, Thermal Conductivity, Viscosimeters, EDB/360606, Thermophysical properties.

The measurement capabilities to be developed include new apparatus for transport properties, thermodynamic properties, phase equilibria, and dielectric properties. Specific capabilities are: Thermal conductivity apparatus, vibrating wire viscometer, dual-sinker densimeter, high-temperature vibrating tube densimeter, dynamic phase equilibria apparatus, ap-

paratus for dilute solutions, total-enthalpy flow calorimeter. Benchmark measurements were made (no data given) on pure and mixed alternative refrigerants and their mixtures with lubricants, and other fluids.

00,119
PB93-124824 Not available NTIS
National Inst. of Standards and Technology (PL), Boulder, CO. Quantum Physics Div.
Lowest Energy Singlet State of Tetrathiophene, an Oligomer of Polythiophene.
Final rept.
D. Birnbaum, D. Fichou, and B. E. Kohler. 1992, 5p.
Pub. in Jnl. of Chemical Physics 96, n1 p165-169, 1 Jan 92.

Keywords: Temperature range 0000-0013 K, Solid solutions, Mixed crystals, Vibrational spectra, Fluorescence, Excitation, Reprints, *Tetrathiophene, Tetradecane.

Fluorescence and fluorescence excitation spectra have been measured for solid solutions of tetrathiophene in tetradecane at 12 and 4.2 K. At 4.2 K, the spectra exhibit full vibrational resolution (inhomogeneous origin (full width at half-maximum) approximately 5/cm). Narrow band excitation and detection establish that there are four independent, but nearly identical excitation/emission pairs with dipole allowed origins at 22 248, 22 241, 22 214, and 22 187/cm. The data are consistent with the idea that these multiple spectra come from a single tetrathiophene conformer which can occupy four different sites in the tetradecane lattice. The vibrational frequencies of the modes in the ground (excited) state that couple strongly to the electronic excitation are given.

00,120
PB93-124840 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Metallurgy Div.
Predictive Thermodynamic Model for Complex High Temperature Solution Phases XI.
Final rept.
D. W. Bonnell, and J. W. Hastie. 1990, 22p.
Pub. in High Temperature Science, v26 p313-334 1990.

Keywords: *Mathematical models, *Thermodynamic properties, *Silicates, *Fused salts, *Phase transformations, High temperature, Alkali glass, Phase diagrams, Borosilicate glass, Vapor pressure, Mass spectroscopy, Reprints.

A computer-based model has been developed that predicts phase compositions of simple and complex multicomponent, nonideal, high temperature solutions. Component activities in liquid and solid solutions, and gas phase partial pressures can also be determined from the model. The applicability of the model has been demonstrated for representative test cases with solutions of compounds containing up to eight elements. Examples considered here include various silicate, aluminate, aluminosilicate, and lime aluminosilicates, in addition to soda lime and borosilicate glasses, calcined dolomite and illite minerals, and an alkali-rich coal slag. The model results are compared with mass spectrometrically determined vapor species identities and partial pressures and/or activities.

00,121
PB93-124857 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Metallurgy Div.
Ultra-High Temperature Laser Vaporization Mass Spectrometry of SiC and HfO2.
Final rept.
D. W. Bonnell, P. K. Schenck, J. W. Hastie, and M. Joseph. 1989, 10p.
Sponsored by Air Force Office of Scientific Research, Bolling AFB, DC.
Pub. in Proceedings of Symposium on High Temperature Materials Chemistry, v5 p156-165 1989.

Keywords: *High temperature tests, *Silicon carbides, *Hafnium oxides, Vaporizing, Mass spectroscopy, Thermodynamics, Laser applications, Performance evaluation, Reprints, *Laser vaporization mass spectroscopy.

A Laser Vaporization Mass Spectrometric (LVMS) technique, demonstrated earlier for BN and C systems, has been applied to the systems SiC and HfO2 at temperatures of 3500-5000 C. For certain conditions of laser energy, wavelength, pulse width, and plume sampling orientation, the species distributions appear to be thermally equilibrated and representative of the thermodynamic distribution at the hot surface. For SiC, the principal species were -- Si, SiC, SiC2, Si2C, C, C2, C3, Si2, Si3, and for HfO2 -- Hf, O, HfO, HfO2, O2, in approximate order of decreasing abundance. Based on an indirect (beam velocity) temperature determination, the SiC vaporization rate appears to be much less than that based on an extrapolation of lower temperature Knudsen effusion data.

00,122
PB93-125128 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
Exponential Density: Exact Fitting of Structure Moduli by Entropy Maximization.
Final rept.
D. M. Collins, and E. Prince. 1991, 9p.
Pub. in Crystallographic Computing 5: From Chemistry to Biology, Chapter 22, p308-316 1991.

Keywords: *Electron density(Concentration), *Entropy, *Crystallography, Exponential functions, Contours, Optimization, Reprints.

Electron density given as an exponential function can be made to fit subsets of structure moduli exactly by a constrained nonlinear optimization. A dual method is used in which the problem is solved in a space of dimension equal to the number of structure factor constraints. Entropy is the objective function to be maximized. On the joint basis that density must be everywhere positive and exactly match the experimental constraints, the result is shown to be the most general obtainable from an initial phase assignment. If there are other acceptable maps, they cannot be as flat as the electron density map given by this algorithm.

00,123
PB93-125144 Not available NTIS
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Molecular Physics Div.
Partial Structure for trans-1,2-Difluoroethylene from High-Resolution Infrared Spectroscopy.
Final rept.
N. C. Craig, D. W. Brandon, S. C. Stone, and W. J. Lafferty. 1992, 8p.
Pub. in Jnl. of Physical Chemistry 96, n4 p1598-1605 1992.

Keywords: *Fluorohydrocarbons, *Infrared spectra, *Vibrational spectra, Molecular vibration, Spectrum analysis, Molecular structure, Reprints, *trans-1, 2-Difluoroethylene, Rotational constants.

Three bands in the high-resolution infrared spectrum of trans-1,2-difluoroethylene have been examined. An A-type band at 1274/cm due to in-plane CH bending, and a C-type band at 874/cm due to out-of-plane CH bending have been fully analyzed. The B-type component of a hybrid A/B-band at 1657/cm has been partly analyzed. Ground-state rotational constants of A = 1.8934097 (24)/cm, B = 0.13453756 (64)/cm and C = 0.12554344 (59)/cm in a Watson-type Hamiltonian have been fit to 1670 ground-state combination differences derived from the three bands. When CH and CC geometric parameters are held at the cis isomer values, a CCF bond angle of 119.6 deg and a CF bond length of 1.345 A are fit to the principal moments of inertia of the trans isomer. The CCF bond angle is 2.5 deg smaller and the CF bond length is 0.010 A longer in the trans isomer.

00,124
PB93-125169 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
Elastic and Inelastic Neutron Scattering Study of Hydrogenated and Deuterated Trimethylammonium Pillared Vermiculite Clays.
Final rept.
Y. Fan, S. A. Solin, H. Kim, T. J. Pinnavaia, and D. A. Neumann. 1992, 8p.
Pub. in Jnl. of Chemical Physics 96, n9 p7064-7071, 1 May 92.

Keywords: *Neutron scattering, *Hydrogenation, *Deuteration, *Vermiculite, Aluminium silicates, Molecular vibration, Clays, Inelastic scattering, Elastic scattering, Molecular structure, Minerals, Reprints, *Ammonium/trimethyl.

Neutron scattering has been used to study the basal spacing and vibrational excitations of oriented samples of (CH3)3NH(1+)-vermiculite and its deuterated form (CD3)3ND(1+)-vermiculite. Both forms exhibit a basal spacing of 12.71 A and a rich vibrational spectrum in the energy range 20-140 meV for Q perpendicular and parallel to the c-axis. These results are compared with infrared measurements and inelastic neutron scattering results of trimethylammonium halides over the same energy range. The torsional mode of the methyl group has been found to be split by approximately 8 meV due to the top-top interaction between the methyl groups in the trimethylammonium vermiculite.

00,125
PB93-125821 Not available NTIS
National Inst. of Standards and Technology (IMSE), Gaithersburg, MD. Office of Nondestructive Evaluation.
Rototranslational Absorption Spectra of H2-H2 Pairs in the Far Infrared.
Final rept.
W. Meyer, L. Frommhold, and G. Birnbaum. 1989, 15p.
Pub. in Physical Review A 39, n5 p2434-2448 1989.

Keywords: *Hydrogen complexes, Far infrared radiation, Absorption spectra, Colliding beams, Infrared spectra, Line shape, Sum rules, Reprints, Translations.

For the computation of the induced dipole moments, the collisional H2-H2 complex is treated as a molecule in the self-consistent-field and size-consistent, coupled electron pair approximations. The basis set accounts for 95% of the correlation energies and separates correctly at distant range. The average of the induced dipole components is obtained for the case of both H2 molecules in the vibrational groundstate (nu=nu'=0) and recast in a simple but accurate analytical form. The analytical dipole expression is used for computations of the spectral moments (sum rules) and line shapes of the collision-induced rototranslational absorption spectra of molecular hydrogen in the far infrared, over a range of frequencies from 0 to 2200/cm, and for temperatures from 77 to 300 K, using a quantum formalism. Proven isotropic potential models are input. Results suggest that the theory is capable of predicting these spectra reliably at temperatures for which no measurements exist.

00,126
PB93-148948 Not available NTIS
American Chemical Society, Washington, DC.
Journal of Physical and Chemical Reference Data, Volume 21, No. 1, January/February 1992.
Bimonthly rept.
D. R. Lide. c1992, 179p.
See also PB93-148955 through PB93-148989, PB93-149136 and PB92-148162. Prepared in cooperation with American Inst. of Physics, New York. Sponsored by National Inst. of Standards and Technology, Gaithersburg, MD.
Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Research, *Physical chemistry, Sodium chloride, Thermodynamic properties, Cobalt ions, Spectra, Crystal structure, Liquids, Surface extended x-ray absorption fine structure, Surface electron energy loss fine structure, Surface structure, Kerr constants.

Contents:
- Thermodynamic Properties of the NaCl + H2O System. 1. Thermodynamic Properties of NaCl(cr);
- Spectral Data and Grotrian Diagrams for Highly Ionized Cobalt, Co VIII through XXVII;
- Critical Compilation of Surface Structures Determined by Surface Extended X-Ray Absorption Fine Structure (SEXAFS) and Surface Extended Electron Energy Loss Spectroscopy (SEELFS);
- Laser-Induced Kerr Constants for Pure Liquids.

00,127
PB93-148955 Not available NTIS
National Inst. of Standards and Technology, Gaithersburg, MD.
Thermodynamic Properties of the NaCl + H2O System. 1. Thermodynamic Properties of NaCl(cr).
D. G. Archer. c1992, 21p.
Included in Jnl. of Physical and Chemical Reference Data, v21 n1 p1-21 Jan/Feb 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Sodium chloride, *Thermodynamic properties, Specific heat, Enthalpy, Entropy, Crystals, Tables(Data).

The available experimental thermodynamic data for NaCl(cr) have been fitted in order to generate thermodynamic values as a function of temperature and for a nominal pressure of 0.1 MPa. Thermal measurements (heat-capacity values and enthalpy-increment values) have been fitted with a new method. The fitted function and calculated thermodynamic values are given. Estimates of the inaccuracies of the calculated thermodynamic values are also given.

00,128
PB93-148971 Not available NTIS
Oregon State Univ., Corvallis. Dept. of Chemistry.
Critical Compilation of Surface Structures Determined by Surface Extended X-ray Absorption Fine Structure (SEXAFS) and Surface Extended Electron Energy Loss Spectroscopy (SEELFS).
P. R. Watson. c1992, 34p.
Included in Jnl. of Physical and Chemical Reference Data, v21 n1 p123-156 Jan/Feb 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Crystal structure, Spectroscopy, Single crystals, Adsorbates, Reviews, *Surface extended x-ray absorption fine structure, *Surface electron energy loss fine structure, *Surface structure.

The review critically compiles all surface structures derived by the technique of surface extended x-ray absorption fine-structure spectroscopy (SEXAFS) and surface electron energy loss fine-structure spectroscopy (SEELFS) reported in the refereed literature prior to January 1990. They are compared with the extensive low-energy electron diffraction (LEED) (P.R. Watson, J. Phys. Chem. Ref. Data 16, 953 (1987)) and ion scattering databases (P. R. Watson, J. Phys. Chem. Ref. Data 19, 85 (1990)) previously reported. The important experimental and theoretical aspects of such investigations have been extracted into easily understood tabular form supplemented by many figures and ancillary tables and complete references. It is hoped that this compilation will provide a valuable resource both for the surface science specialist and for those nonspecialists in other areas who need surface crystallographic data.

00,129
PB93-148989 Not available NTIS
Reading Univ. (England). J.J. Thomson Physical Lab.
Laser-Induced Kerr Constants for Pure Liquids.
N. J. Harrison, and B. R. Jennings. c1992, 7p.
Included in Jnl. of Physical and Chemical Reference Data, v21 n1 p157-163 Jan/Feb 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Liquids, Kerr effect, Organic compounds, Birefringence, Nonlinear optics, Benzene, Tables(Data), *Kerr constants.

During the past two decades, an increasing number of publications have reported laser-induced birefringence data for pure liquids. To date there has been no comparative collection of values from these experiments. The paper lists the published values together with hitherto unpublished data of the authors of the optically induced Kerr constant B(0). The normalized parameter B(rel) for data compared with benzene under stated wavelength conditions of the light used for the measurements is also given.

00,130
PB93-149045 Not available NTIS
American Chemical Society, Washington, DC.
Journal of Physical and Chemical Reference Data, Volume 21, No. 4, July/August 1992.
Bimonthly rept.
D. R. Lide. c1992, 157p.
See also PB93-149052 through PB93-149086 and PB93-149029. Prepared in cooperation with American Inst. of Physics, New York. Sponsored by National Inst. of Standards and Technology, Gaithersburg, MD.
Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Research, *Physical chemistry, Propellant combustion, Reaction kinetics, Sodium chloride, Thermodynamic properties, Nitrogen oxides, Vibrational spectra, Hydrogen, Argon, Atom-molecule collisions, Ion-molecule collisions, Ion-atom collisions.

Contents:
Chemical Kinetic Data Base for Propellant Combustion. II. Reactions Involving CN, NCO, and HNCO;
Thermodynamic Properties of the NaCl + H2O System. II. Thermodynamic Properties of NaCl(aq), NaCl2H2O(cr), and Phase Equilibria;
Vibrational Bands of H(x)N(y)O(z) Molecules;
Collisions of H(+), H((sub 2)(+)), H((sub 3)(+)), ArH(+), H(-), H and H2 with Ar and Ar(+) and ArH(+) with H2 for Energies from 0.1 eV to 10 keV.

00,131
PB93-149052 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Chemical Kinetics Div.
Chemical Kinetic Data Base for Propellant Combustion. 2. Reactions Involving CN, NCO, and HNCO.
W. Tsang. c1992, 39p.
Included in Jnl. of Physical and Chemical Reference Data, v21 n4 p753-791 Jul/Aug 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Propellant combustion, *Reaction kinetics, Temperature range 0400-1000 K, Temperature range 1000-4000 K, Polyatomic molecules, Chemical reactions, Data bases, Nitramines, Tables(Data).

The paper contains evaluated chemical kinetic data on single step elementary reactions involving small polyatomic molecules which are of importance in propellant combustion. The work consists of the collection and evaluation of mechanistic and rate information and the use of various methods for the extrapolation and estimation of rate data where information does not exist. The conditions covered range from 500-2500 K and 10(sup 17)-10(sup 22) particles/cc. The results of the second year's effort add to the existing data base reactions involving CN, NCO and HNCO with each other and the following species: H, H2, H2O, O, OH, HCHO, CHO, CO, NO, NO2, HNO, HNO2, HCN, and N2O.

00,132
PB93-149060 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Chemical Kinetics and Thermodynamics Div.
Thermodynamic Properties of the NaCl + H2O System. 2. Thermodynamic Properties of NaCl(aq), NaCl2H2O(cr), and Phase Equilibria.
D. G. Archer. c1992, 37p.
Included in Jnl. of Physical and Chemical Reference Data, v21 n4 p793-829 Jul/Aug 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Sodium choloride, *Thermodynamic properties, Temperature range 0273-0400 K, Temperature range 0400-1000 K, Aqueous solutions, Activity coefficients, Equations of state, Gibbs free energy, Specific heat, Crystals, Density, Enthalpy, Osmosis, Solubility, Vapor pressure, Tables(Data), Phase equilibrium.

Equations that described the thermodynamic properties of the NaCl + H2O system were obtained from a fit to experimental results for the system. The experimental results included in the fit spanned the range of temperature of approximately 250 to 600 K and, where available, the range of pressure from the vapor pressure of the solution to 100 MPa. New equations and/or values for the following properties are given in the present work: (1) (Delta f)G(sub m, sup 0) and (Delta f)H(sub m, sup 0), for formation from the elements, for NaCl(cr) for 298.15 K and 0.1 MPa, (2) (Delta f)G(sub m, sup 0) and (Delta f)H(sub m, sup 0) from the elements, as well as S(sub m, sup 0) and C(sub p,m, sup 0), all for 298.15 K, 0.1 MPa, for NaCl.2H2O(cr), (3) the change in chemical potential for both NaCl and H2O in NaCl(aq) as a function of temperature, pressure, and molality, valid from 250 to 600 K and, where available, from the vapor pressure of the solution to 100 MPa. Comparison of the accuracies of experimental methods, where possible, has also been performed.

00,133
PB93-149078 Not available NTIS
Universite Libre de Bruxelles (Belgium).
Vibrational Bands of HxNyOz Molecules.
F. Melen, and M. Herman. c1992, 51p.
Included in Jnl. of Physical and Chemical Reference Data, v21 n4 p831-881 Jul/Aug 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Nitrogen oxides, *Vibrational spectra, Infrared spectra, Raman spectra, Band spectra, Polyatomic molecules, Nitrous acid, Nitric acid, Atmospheric composition, Tables(Data).

A compilation of experimental data is presented which covers all known molecular species fitting the (1)H(x)(14)N(y)(16)O(z)(y,z, not = 0) chemical formula. The vibrational bands of these compounds in gas, liquid, solid, and matrix are listed, together with their assignments and the relevant references. Most of the literature before October 1991 is covered.

00,134
PB93-149110 Not available NTIS
Emory Univ., Atlanta, GA. Dept. of Chemistry.
Solubility of Some Sparingly Soluble Salts of Zinc and Cadmium in Water and in Aqueous Electrolyte Solutions.
H. L. Clever, M. E. Derrick, and S. A. Johnson. c1992, 64p.
Included in Jnl. of Physical and Chemical Reference Data, v21 n5 p941-1004 Sep/Oct 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Cadmium inorganic compounds, *Zinc inorganic compounds, *Solubility, Aqueous electrolytes, Water, Tables(Data).

The literature on the solubility of the sparingly soluble inorganic salts of zinc and cadmium in water and in aqueous electrolyte solutions has been reviewed. The solubility data have been compiled and evaluated. Recommended or tentative values of the solubilities and the solubility products have been given when warranted. Auxiliary thermodynamic and crystallographic data useful in the interpretation of solubility data are given. For the many zinc and cadmium substances for which only limited solubility data are available, unevaluated values are given in an annotated bibliography with emphasis on solubility data published since 1950.

00,135
PB93-150696 Not available NTIS
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Molecular Physics Div.
Determination of the Structure of CO2-H2CO.
Final rept.
T. A. Blake, S. E. Novick, F. J. Lovas, and R. D. Suenram. 1992, 11p.
See also PB88-189311.
Pub. in Jnl. of Molecular Spectroscopy 154, p72-82 1992.

Keywords: *Carbon dioxide, *Formaldehyde, *Complexes, Van der Waals forces, Deuterium compounds, Microwave spectroscopy, Fourier spectroscopy, Molecular structure, Molecular beams, Electric moments, Dipole moments, Reprints.

The structure of the weakly bound complex CO2-H2CO has been determined by pulsed-jet Fourier-transform microwave spectroscopy. The spectroscopic constants of three isotopomers, CO2-H2CO, (13)CO2-H2 CO, and CO2-D2CO, have been determined. Two distinct states of the complex are seen. These are caused by inversion doubling from 'rotation' of the formaldehyde about its twofold axis. The complex is planar with the C2 axis of formaldehyde almost parallel to the D(infinity h) axis of carbon dioxide. The center-of-mass to center-of-mass distance is 3.171 A.

00,136
PB93-150720 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Surface and Microanalysis Science Div.
Subpicosecond Probing of Vibrational Energy Transfer at Surfaces.
Final rept.
R. R. Cavanagh, J. D. Beckerle, M. P. Casassa, E. J. Heilweil, and J. C. Stephenson. 1992, 7p.
Pub. in Surface Science 269/270, p113-119 1992.

Keywords: *Carbon monoxide, *Surfaces, Vibrational spectra, Ultraviolet radiation, Infrared radiation, Energy transfer, Adsorption, Platinum, Dynamics, Reprints, Femtosecond pulses.

Subpicosecond infrared pump-probe techniques are applied to the excited vibrational state dynamics of adsorbed CO on Pt(111). The CO (nu = 1) adlayer is probed as a function of IR pump fluence and CO coverage (0.1 = or < theta (CO) = or < 0.5 ML). Spectral shifts in the transient CO vibrational spectrum are observed, indicative of a shift to lower frequency of the

CO internal stretch mode as the degree of excitation of the adlayer is increased. The observed transient spectral response is discussed in terms of density matrix models which address the coherence time of the adlayer (nu = 1) excitation, and in terms of the excited state spectral characteristics of strongly coupled anharmonic oscillators. The two-to-three picosecond recovery time of the transient response is consistent with relaxation through electron-hole pair creation.

00,137
PB93-150753 Not available NTIS
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Molecular Physics Div.
High-Resolution FTIR Study of the nu4 Band of CH2F2.
Final rept.
M. N. Deo, R. D'Cunha, A. Weber, and W. B. Olson. 1992, 10p.
Pub. in Jnl. of Molecular Spectroscopy 154, p83-92 1992.

Keywords: *Infrared spectra, Fourier spectroscopy, Absorption spectra, Vibrational spectra, Rotational spectra, Band spectra, High resolution, Reprints, *Methylene fluorides.

The infrared absorption spectrum of the nu(4) fundamental band of CH2F2 has been measured in the region 460-600/cm under high resolution. More than 2,700 lines have been assigned in this B-type band of the lowest fundamental centered at 528.5/cm. These data have been combined with all available pure rotational measurements on the upper state in a least-squares fit. Accurate values for the band origin and other molecular parameters for the nu(4) state have been obtained which fit the data with an overall standard deviation of 3.7 X 10(sup -4)/cm.

00,138
PB93-150803 Not available NTIS
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Molecular Physics Div.
Microwave and Infrared Spectra of C2H4...HCCH: Barrier to Twofold Internal Rotation of C2H4.
Final rept.
G. T. Fraser, F. J. Lovas, R. D. Suenram, J. Z. Gillies, and C. W. Gillies. 1992, 11p.
Pub. in Jnl. of Chemical Physics 163, p91-101 1992.

Keywords: *Acetylene, *Ethylene, *Complexes, *Microwave spectra, *Infrared spectra, Van der Waals forces, Hydrogen bonds, Deuterium compounds, Reprints.

Microwave spectra of C2H4...HCCH, C2H4...DCCH, C2H4...DCCD, D2C=CH2...HCCH, and trans-HDC=CHD...HCCH have been recorded using a pulsed-nozzle Fourier-transform microwave spectrometer. An alpha-type, Delta K(alpha)=0 spectrum is observed, with a number of transitions being split into doublets due to tunneling arising from the hindered internal rotation of the ethylene unit about its C=C bond. For the normal isotopic species we find A=25981(33) MHz, B+C=3478.2560(13) MHz, and B-C=89.45(18) MHz. The complex is shown to have a C(sub 2(nu)) structure in which the HCCH unit hydrogen bonds to the ethylene pi cloud, with the HCCH axis normal to the plane of the ethylene. An infrared spectrum of the asymmetric acetylenic C-H stretch in the complex has also been measured using an optothermal color-center laser spectrometer. The rotational lines are predissociation broadened, preventing the resolution of K structure. The observed band origin nu(sub 0) = 3271.61/cm, is nearly identical to that found for the similar vibration in the acetylene dimer.

00,139
PB93-150852 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Thermophysics Div.
Measurement of the Dipole Moment of Gaseous 1,1,1-trichlorotrifluoroethane, 1,2-difluoroethane, 1,1,2-trichlorotrifluoroethane, and 2-(difluoromethoxy)-1,1,1-trifluoroethane.
Final rept.
A. R. H. Goodwin, and G. Morrison. 1992, 6p.
Pub. in Jnl. of Physical Chemistry 96, n13 p5521-5526, 25 Jun 92.

Keywords: *Fluorohydrocarbons, *Dipole moments, *Dielectric properties, *Polarization(Charge separation), Refractivity, Temperature dependence, Density(Mass/volume), Reprints, *1-1-1-2-((Difluoromethoxy)-1), 1-1-Trichlorotrifluoroethane, 2-Difluoroethane, 1-2-Trichlorotrifluoroethane, 1-1-trifluoroethane.

The relative permittivity (dielectric constant) in gaseous 1,1,1-trichlorotrifluoroethane, 1,2-difluoroethane, 1,1,2-trichlorotrifluoroethane, and 2-(difluoromethoxy)-1,1,1-trifluoroethane at temperatures between 293 and 378 K has been obtained from capacitance measurements using a parallel plate capacitor. Molecular polarizabilities have been determined from the results. We report the electronic polarization for each fluid determined from liquid-phase index of refraction measurements at 297 K. Equilibrium dipole moments (mu) have been determined from the combined results. Estimates are given for the dipole moment of individual conformers where the dipole moment is temperature dependent. 1,2-Difluoroethane, for which dmu/dT < 0, exhibits the gauche effect; the temperature dependence of mu for 1,1,2-trichlorotrifluoroethane is similar. We also report liquid densities for 1,1,1-trichlorotrifluoroethane and 1,2-difluoroethane.

00,140
PB93-151207 Not available NTIS
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Molecular Physics Div.
3nu3 Band of (32)S(16)O2: Line Positions and Intensities.
Final rept.
W. J. Lafferty, G. T. Fraser, A. S. Pine, V. Dana, J. Y. Mandin, A. Barbe, J. J. Plateaux, S. Bouazza, J. M. Flaud, and C. Camy-Peyret. 1992, 10p.
Pub. in Jnl. of Molecular Spectroscopy 154, p51-60 1992.

Keywords: *Sulfur dioxide, *Infrared spectra, Vibrational spectra, Band spectra, Fourier spectroscopy, Room temperature, Venus atmosphere, Hamiltonian functions, High resolution, Reprints.

The room-temperature high-resolution infrared spectrum of the alpha-type 3nu(sub 3) asymmetric S-O stretching overtone band of SO2 has been investigated at long path lengths (28-80 m) in two different laboratories using difference-frequency laser and Fourier-transform infrared spectrometers. The effectively unperturbed spectrum has been fit to a Watson asymmetric-top Hamiltonian to a precision of 0.0003/cm to yield a band origin of 4054.00117(4)/cm and a complete set of rotational and centrifugal distortion constants. The intensities have been fit using Herman-Wallis type corrections to account for the K(a) dependence of the effective vibrational transition moment, giving a rotationless transition moment and an integrated band intensity for (32)SO2. The present results furnish data necessary to test the recent assignment of a feature in the infrared spectrum of Venus on the 3nu(sub 3) band of SO2.

00,141
PB93-151629 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Surface and Microanalysis Science Div.
Comparison of Measured and Calculated Appearance-Potential Spectra for Six 3d Metals.
Final rept.
C. J. Powell, N. E. Erickson, and D. E. Ramaker. 1992, 5p.
Pub. in Physica Scripta T41, p175-179 1992.

Keywords: *Chromium, *Cobalt, *Iron, *Nickel, *Titanium, *Vanadium, Greens function, Measurement, Computation, Comparison, Polycrystals, Reprints, *Appearance-potential spectra.

We report comparisons of measured and calculated L(3)-shell appearance-potential spectra (APS) for Ti, V, Cr, Fe, Co and Ni. The measurements were made with polycrystalline specimens and with a carefully calibrated electron energy scale.

00,142
PB93-151637 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Process Measurements Div.
Measurement of the Density Shift of the H2Q(0-5) Transitions from 295 K to 1000 K.
Final rept.
L. A. Rahn, and G. J. Rosasco. 1990, 9p.
Pub. in Physical Review A 41, n7 p3698-3706 1990.

Keywords: *Hydrogen, Temperature range 0273-0400 K, Temperature range 0400-1000 K, Temperature dependence, Raman spectroscopy, Electron transitions, High resolution, Quantum numbers, Measurement, Reprints, J dependence.

We report results of a high-resolution inverse Raman spectroscopy (IRS) study of the dependence on temperature and rotational quantum number (J) of the Raman Q-branch self-density-shift coefficients of pure (natural) hydrogen. The population-correlated J-dependence of these coefficients, previously established at lower temperatures as a 'coupling shift,' is observed to persist, almost independent of temperature, up to 1000 K. The temperature dependence of the overall shift is found to disagree above 500 K with extrapolations of recent theoretical calculations.

00,143
PB93-151652 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Thermophysics Div.
Kinetics of Bimolecular Recombination Processes with Trapping.
Final rept.
J. C. Rasaiah, J. B. Hubbard, R. J. Rubin, and S. H. Lee. 1990, 11p.
Pub. in Jnl. of Physical Chemistry 94, n2 p652-662 1990.

Keywords: *Recombination reactions, Computerized simulation, Time dependence, Diffusion, Trapping, Kinetics, Reprints, Bimolecular recombination.

We report the results of a computer simulation and analysis of diffusion-controlled bimolecular recombination on a 2-dimensional I. (a) A + A -->*; (b) A + T --> A(T); (c) A(T) + A --> T; and II. (a) A + A -->*; (b) A --> A(T); (c) A(T) + A -->*. Reaction I refers to recombination with bimolecular trapping (b), while reaction II refers to recombination with unimolecular trapping (b). In either case the time dependence of the trapped population (A(T)) is described remarkably well by a mean field theory, while the free population (A) decays as a stretched exponential at long times (exp(-t(sup alpha)), alpha approx = 1/2). However, it is possible to distinguish between mechanisms I and II simply by monitoring a single particle density (A or A(T)) for a range of initial conditions.

00,144
PB93-151751 Not available NTIS
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Radiometric Physics Div.
Resonance Effects in the 5Sigma(-1) Photoionization Channel of CO.
Final rept.
M. R. F. Siggel, M. A. Hayes, M. A. MacDonald, A. C. Parr, J. E. Hardis, I. Iga, V. Tiit, J. B. West, and J. L. Dehmer. 1992, 7p.
Sponsored by Department of Energy, Washington, DC.
Pub. in Jnl. of Chemical Physics 96, n10 p7433-7439, 15 May 92.

Keywords: *Carbon monoxide, *Photoionization, Angular distribution, Branching ratio, Photoelectrons, Ultraviolet radiation, Reprints.

Vibrational branching ratios and photoelectron angular distributions are reported for the 5/sigma photoionization channel of CO in the range 16eV <h(nu)<45eV. Striking non-Franck-Condon effects are observed in both the branching ratios and angular distributions as a result of various autoionizing states and a sigma shape resonance that lie in this spectral range. The goal of the present measurement was to observe definitive evidence for the sigma shape resonance via its non-Franck-Condon effects on the vibrational ionization channels. Guided by recent calculations (Smith, Lynch, and McKoy, J. Chem. Phys. 85, 6455 (1986)), we examined the broad structure in the vibrational branching ratios and angular distributions in the range 25eV<hv<40eV. There, we found clear evidence for the sigma shape resonance in the quantities beta(nu(+) = 0 and 1) and sigma(nu(+) = 2)/sigma(nu(+) = 0). Substantial differences between theory and experiment for the sigma(nu(+) = 1)/sigma(nu(+) = 0) branching ratio, however, serve to define the limitations of the current single-channel picture for this process.

00,145
PB93-153187 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Surface and Microanalysis Science Div.
Vibrational Line Shape of Diatomic Adsorbates on Metal Clusters.
Final rept.
E. Blaisten-Barojas, and J. W. Gadzuk. 1992, 9p.
Sponsored by National Science Foundation, Washington, DC.

Pub. in Jnl. of Chemical Physics 97, n2 p862-870, 15 Jul 92.

Keywords: *Adsorbates, *Atomic clusters, *Vibrational spectra, *Molecular relaxation, Relaxation time, Carbon monoxide, Rhodium, Cobalt, Line shape, Reprints, *Metal clusters.

A decrease of at least an order of magnitude in the vibrational relaxation time T(1) has been measured for CO bonded to Rh and Co clusters when the size of the cluster increases from 5 to 35 A. We propose that this effect is mainly due to the coupling of the molecular vibration omega(0) with the electron-hole excitations in the cluster. This is described via a model Hamiltonian. The finite size of the clusters give rise to a discrete electronic spectrum, and hence to a discrete pair excitation spectrum. This effect is measured in terms of D, the mean spacing between nearest-neighbor levels in the conduction band of the cluster. We find that: (1) the proposed mechanism starts to contribute to T(1) only when D<h(bar) omega(0); (2) T(1) is at least several hundred ps for clusters less than 15 A in size; (3) there is a sharp decrease of T(1) to about 10 ps as the cluster size increases from 15 to 40 A; (4) T(1) decreases smoothly towards the bulk value for larger clusters.

00,146
PB93-153260 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
Structure and Low Energy Dynamics of Solid C60.
Final rept.
J. R. D. Copley, D. A. Neumann, R. L. Cappelletti, N. Coustel, J. P. McCauley, N. C. Maliszewskyj, J. E. Fischer, A. B. Smith, K. M. Creegan, D. M. Cox, W. A. Kamitakahara, and E. Prince. 1992, 3p.
Pub. in Physica B 180-181, p706-708 1992.

Keywords: *Fullerenes, Neutron diffraction, Inelastic scattering, Cryogenic temperature, Room temperature, Reprints, *Buckminsterfullerene, Bragg diffraction.

A simple model explains both the Bragg peaks and the diffuse scattering observed in neutron diffraction measurements on solid C60 at 295 and 14 K. Neutron inelastic scattering measurements reveal dynamic orientational disorder above the order-disorder transition temperature. An analysis of the diffraction results shows that significant disorder remains at 14 K.

00,147
PB93-153336 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Biotechnology Div.
Conversion of Temperatures and Thermodynamic Properties to the Basis of the International Temperature Scale of 1990.
Final rept.
R. N. Goldberg, and R. D. Weir. 1992, 18p.
Pub. in Pure and Applied Chemistry 64, n10 p1545-1562 1992.

Keywords: *Temperature scales, *Thermodynamic properties, Temperature dependence, Specific heat, Enthalpy, Entropy, Reprints.

Tables of temperature differences between the International Temperature Scale of 1990 (ITS-90) and earlier temperature scales (IPTS-68, EPT-76, IPTS-48, and ITS-27) are presented. These tables also contain values of the derivatives of these differences with respect to temperature. Analytical equations to reproduce the temperature difference (T90 - T68) and its first derivative are also given. This information is needed for the adjustment of thermodynamic results to the basis of the ITS-90. Thus, for the most accurate thermodynamic results, it is preferable to change the temperatures of the original work to the ITS-90 and then recalculate the thermodynamic results on this basis. However, conversion formulae based upon a Taylor expansion of the enthalpy have been derived previously by Douglas (J. Res. Natl. Bur. Stand., Sect. A 73, 451-470 (1969)). These equations are greatly simplified when the differences between the two temperature scales are small. Approximate effects resulting from the conversion from the IPTS-68 to the ITS-90 and from the IPTS-48 to the ITS-90 for existing calorimetric determinations of heat capacity, enthalpy, and entropy have been calculated with the equations of Douglas for ND4ReO4(s), BaSnF4(s), alpha-Al2O3(s), (BeO)(Al2O3)(s), (BeO)(3Al2O3)(s), and Mo(s). It is found that only the most accurate thermodynamic results require examination and possible adjustment because of a change in the temperature scale.

00,148
PB93-153484 Not available NTIS
National Inst. of Standards and Technology (CSTL), Boulder, CO. Thermophysics Div.
Prediction of Fluid Phase Equilibrium of Ternary Mixtures in the Critical Region and the Modified Leung-Griffiths Theory.
Final rept.
J. J. Lynch, J. C. Rainwater, L. J. Van Poolen, and D. H. Smith. 1992, 8p.
Sponsored by Department of Energy, Washington, DC.
Pub. in Jnl. of Chemical Physics 96, n3 p2253-2260, 1 Feb 92.

Keywords: *Liquid-vapor equilibrium, *Alkanes, Isotherms, Fluids, Reprints, Leung-Griffiths theory, Phase equilibrium, Ternary mixtures, Corresponding states.

The modified Leung-Griffiths theory of vapor-liquid equilibrium (VLE) is generalized to the case of three components. The principle of 'corresponding states' is reconsidered along with certain functions of 'field variables' within the model. The mathematical form of the coexistence boundary in terms of the field variables remains practically unchanged and conforms to modern scaling theory. The new model essentially predicts ternary fluid mixture phase boundaries in the critical region from previous vapor-liquid equilibrium data correlations of the three binary fluid mixture limits. Predicted saturation isotherms of the ethane + n-butane + n-pentane and ethane + n-butane + n-heptane mixtures are compared with experimental ternary VLE data in the literature.

00,149
PB93-153740 Not available NTIS
National Inst. of Standards and Technology (CSTL), Boulder, CO. Process Measurements Div.
Note on the Number Dependence of Nonequilibrium Molecular Dynamics Simulations of the Viscosity of Structured Molecules.
Final rept.
R. L. Rowley, and J. F. Ely. 1992, 2p.
Pub. in Jnl. of Chemical Physics 96, n6 p4814-4815, 15 Mar 92.

Keywords: *Butanes, *Viscosity, Lennard-Jones potential, Simulation, Reprints, Molecular dynamics, Number dependence.

The number dependence of nonequilibrium molecular dynamics simulations of the viscosity of n-butane was investigated. A site-site Lennard-Jones potential was used in the simulations. We found that a break in the linear behavior of eta* with gamma*(sup 1/2) at values of alpha*(sup 1/2) larger than 0.5 is the result of values of a real phenomenon, rather than a number-dependent artifact.

00,150
PB93-160786 PC A14/MF A03
National Inst. of Standards and Technology (CSTL), Boulder, CO. Thermophysics Div.
Tables for the Thermophysical Properties of Ethane.
Technical note.
D. G. Friend, J. F. Ely, and H. Ingham. Jan 93, 319p, NIST/TN-1346.
Also available from Supt. of Docs. as SN003-003-03199-2. See also NISTIR-3953.

Keywords: *Ethane, *Thermodynamic properties, *Thermophysical properties, Specific heat, Thermal conductivity, Viscosity, Temperature dependence, Pressure dependence, Tables(Data), Graphs(Charts).

The thermophysical properties of ethane are tabulated for a large range of the fluid state based on recently formulated correlations. For the thermodynamic properties, temperatures from 90 to 625 K at pressures less than 70 MPa are included; for the viscosity, the corresponding range is 90-500 K with pressures to 60 MPa; for the thermal conductivity the range is 90-600 K with pressures to 70 MPa. In addition to the tables of properties, algebraic expressions and associated tables of coefficients are given to allow additional property calculations. Graphical comparisons between experimental property determinations and the correlation are also given both for primary data used in the formulation of the correlations and for additional data. A listing of a FORTRAN program for the evaluation of ethane thermophysical properties is included.

00,151
PB93-165983 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Metallurgy Div.
In situ Analysis of Laser-Induced Vapor Plumes.
Final rept.
P. K. Schenck, D. W. Bonnell, and J. W. Hastie. 1989, 19p.
Pub. in High Temperature Science 27, p483-501 1989.

Keywords: Refractory materials, Mass spectroscopy, Emission spectra, High temperature, Thermochemistry, Graphite, Plumes, Reprints, *Laser vaporization, Yttrium barium cuprates.

Laser-induced vapor plumes are becoming important in the processing of advanced materials and as a medium for fundamental high temperature chemistry experiments. Techniques are required for the spatial and temporal analysis of such plumes. Time-resolved mass spectra of C(n) (n = 1 - 9) neutral vapor species have been obtained from graphite targets using various interaction orientations and plume sampling geometries. C, C, and C have also been observed in the laser-induced plume. Mass spectra from superconducting YBa2Cu3O(x) targets also showed a diversity of species present in the laser-induced plumes, including both neutral and ionic Y, Ba, and Cu, and molecular species such as BaO, CuO(1+), YO and bimetallics (BaCu, YCu). Time and spatially resolved optical emission spectra have been obtained. With graphite targets, intense emission was observed from C, C(1+) and C(1+)+ in the near UV. Molecular C2 emission was also observed in the vicinity of the surface/plume interface. The emission spectra obtained from the superconducting YBA2Cu3O(x) targets included intense lines from both neutral and ionic Y, Ba and Cu as well as YO.

00,152
PB93-166064 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Chemical Kinetics Div.
Rate Constants for Hydrogen Abstraction Reactions of NO3 in Aqueous Solution.
Final rept.
L. V. Shastri, and R. E. Huie. 1990, 8p.
See also PB91-203232.
Pub. in International Jnl. of Chemical Kinetics 22, p505-512 1990.

Keywords: *Free radicals, *Reaction kinetics, *Ethers, *Alcohols, Molecular structure, Solutions, Reprints, *Nitrate radical, Hydrogen abstraction.

Rate constants have been measured by pulse radiolysis for the reactions of the NO3 radical with five cyclic ethers and a series of alcohols. Rate constants ranged from 3.5 x 10 to the power of 4/M/s for deuterated methanol to 1.1 x 10 to the power of 7/M/s for tetrahydrofuran. The rate constants for the reactions of NO3 with the alcohols 1-propanol to 1-heptanol were found to be linearly dependent on the number of CH2 groups with a group reactivity of 6.4 x 10 to the power of 5/M/s.

00,153
PB93-166072 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Chemical Kinetics Div.
Formation and Reactivity of Hypophosphite and Phosphite Radicals and Their Peroxyl Derivatives.
Final rept.
L. V. Shastri, R. E. Huie, and P. Neta. 1990, 5p.
Sponsored by Department of Energy, Washington, DC.
Pub. in Jnl. of Physics and Chemistry 94, n5 p1895-1899 1990.

Keywords: Aqueous solutions, Electron transfer, Chemical radicals, Chemical reactivity, Radiolysis, Reprints, *Hypophosphite radicals, *Phosphite radicals.

The formation and properties of the radicals derived from hypophosphite and phosphite ions in aqueous solutions have been studied by pulse- and gamma-radiolysis techniques. Hydroxyl radicals and hydrogen atoms abstract H rapidly from the P-H bond to yield P-centered radicals.

00,154
PB93-166189 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Reflected and Refracted Fundamental Modes of Dynamic X-ray Diffraction.
Final rept.
R. D. Spal. 1991, 4p.
Pub. in Crystallographica Section A 47, p223-226 May 91.

Keywords: *X-ray diffraction, *Energy absorption, Crystallography, Reflection, Refraction, X-ray analysis, Mathematical models, Reprints.

An energy conservation relation is derived between the power absorption, energy flux, and absorption coefficient of an arbitrary fundamental mode in the n beam dynamical theory of x-ray diffraction. From this relation, it is proven that the 4n fundamental modes selected by arbitrary incidence conditions are evenly divided into two types. The types are distinguished by the sign of their absorption coefficient, and by the sign of their energy flux through a plane of constant absorption. They represent reflected and refracted beams.

00,155
PB93-166205 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Chemical Kinetics Div.
Prediction of Carbon-Hydrogen Bond Dissociation Energies for Polycyclic Aromatic Hydrocarbons of Arbitrary Size.
Final rept.
S. E. Stein, and R. L. Brown. 1991, 7p.
Pub. in Jnl. of the American Chemical Society 113, n3 p787-793 1991.

Keywords: *Dissociation energy, *Chemical bonds, *Aromatic polycyclic hydrocarbons, Enthalpy, Molecular orbitals, Quantum chemistry, Graphite, Reprints, Proton affinity.

A method has been developed for estimating C-H bond dissociation energies at the edges of polycyclic aromatic hydrocarbons of arbitrary size. A series of reference molecules having well established bond dissociation enthalpies are used to represent several types of dissociations. For each type, Huckel molecular orbital theory is used to calculate the pi-electron energy difference between reactant and product. This difference is then used to calculate relative bond dissociation enthalpies. Predictions are also made of C-H bond dissociation enthalpies at the perimeters of infinite graphite layers having several different edge structures. Energies depend principally on chemical structures near the bond of interest and little on overall molecular size. Along with available ionization energies, these results also allow estimation of proton affinities at the edges of a layer of graphite. These proton affinities depend on both the chemical structures at the site of protonation and the overall molecular size.

00,156
PB93-166239 Not available NTIS
National Inst. of Standards and Technology (NEL), Boulder, CO. Thermophysics Div.
Field-Space Conformal Solution Method: Binary Vapor-Liquid Phase Behavior.
Final rept.
T. S. Storvick, and J. R. Fox. 1990, 12p.
See also PB90-254566.
Pub. in International Jnl. of Thermophysics 11, n1 p61-72 Jan 90.

Keywords: *Alkanes, *Binary mixtures, *Vapors, *Liquid phases, *Phase transformations, Density(Mass/volume), Equations of state, Thermodynamic properties, Butanes, Pentanes, Hexanes, Octanes, Reprints.

The field-space conformal solution method provides a new procedure for estimating the coexistence phase properties of a binary mixture using only the saturated properties of a pure reference fluid. The method is implemented and the pTxy properties of three binary mixtures, n-butane with n-pentane, n-hexane, and n-octane, are correlated. The properties of pure, saturated n-butane were used as the reference fluid. They were calculated using the Peng-Robinson and the 32-constant Benedict-Webb-Rubin equations of state. The mixture vapor densities were successfully predicted beyond the mixture critical point for the mixtures using the BWR generated reference fluid data. The liquid densities were overestimated. Recommendations are made to improve the correlating power and the commercial utility of this method.

00,157
PB93-166262 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Molecular Physics Div.
Microwave Spectrum of (D2O)2.
Final rept.
R. D. Suenram, G. T. Fraser, and F. J. Lovas. 1989, 10p.
Pub. in Jnl. of Molecular Spectroscopy 138, n2 p440-449 1989.

Keywords: *Microwave spectra, Van der Waals forces, Hydrogen bonds, Intermolecular forces, Deuterium compounds, Complexes, Reprints, *Water dimers.

Microwave spectra of the a-type K(a)=0 and 1 subbands of (D2O)2 for the A(1)(+-), B(1)(+-), A(2)(+-), B(2)(+-), and E(+-) rotational-tunneling states have been recorded between 9 - 110 GHz using pulsed-nozzle Fourier-transform and electric-resonance optothermal spectrometers. The tunneling splitting for the K(a)=0, A(2)(+-)/B(2)(+-) states is determined to be 1083.303(21) MHz, which is slightly lower than the 1172.115(14) MHz value observed previously for the A(1)(+-)/B(1)(+-) states. From these splittings the tunneling matrix elements associated with the geared and anti-geared proton-acceptor proton-donor interchange motions are calculated.

00,158
PB93-166445 Not available NTIS
National Inst. of Standards and Technology (IMSE), Gaithersburg, MD. Reactor Radiation Div.
Inelastic Neutron Scattering in Molecular Crystals.
Final rept.
S. F. Trevino. 1989, 10p.
Pub. in Proceedings of International Conference on Phonons 89, Heidelberg, Federal Republic of Germany, August 21-25, 1989, v1 p7-16.

Keywords: *Molecular crystals, *Ammonium perchlorates, *Graphite, *Neutron scattering, Inelastic scattering, Selection rules, Intercalation, Phonons, Reprints, Methyl groups.

In the present brief review the authors would like to present three topics which have in common that the materials under study are molecular crystals and that their properties have been investigated by neutron scattering. The first two are of relatively recent interest and enjoy substantial international activity (rotational motions in the solid and interactions of intercalated species in graphite). The third, the measurement of phonons in molecular crystals, is of rather older vintage. The example chosen here is of a rather more complicated system, ammonium perchlorate, than usually encountered in the literature, but one in which interesting group theoretical rules are used as an aid in the identification of the observed phonon groups.

00,159
PB93-166452 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
Molecular Dynamical Studies of Energy Transport and Energy Sharing in Molecular Dissociation.
Final rept.
D. H. Tsai. 1990, 25p.
Pub. in NATO ASI Ser., Ser. C 309, p229-253 1990.

Keywords: *Dissociation, *Detonation, Diatomic molecules, Molecular crystals, Energy transfer, Mathematical models, Shock waves, Simulation, Reprints, Molecular dynamics, Energetic materials.

The authors discuss their simulation studies of the dissociation of a diatomic molecular crystal by the method of molecular dynamics. Their objectives were to determine the dynamical properties of the model, to ascertain that they were realistic, and to investigate the mechanisms of energy transfer and energy sharing in such a system. The results showed that when the energy release was endothermic, the kinetics of the model followed the Arrhenius relation, consistent with thermodynamic considerations. These results, moreover, remained consistent when three-body interactions were introduced. When the energy release was exothermic, the dissociation reaction proceeded rapidly to completion, and the results showed the details of thermal initiation and various energy transfer processes among the molecules and the products, as well as other effects such as induction time, 'caging,' etc. The authors were also able to examine the energy relaxation process when the vibrational degree of freedom alone was heated. These results suggest that molecular dynamics may be further developed into a tool for detonation research from an atomistic viewpoint.

00,160
PB93-166460 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Chemical Kinetics Div.
Chemical Kinetic Data Base for RDX Combustion.
Final rept.
W. Tsang. 1989, 9p.
Pub. in Proceedings of JANNAF Combustion Meeting (26th), Pasadena, CA., 1989, p93-101.

Keywords: *Reaction kinetics, *RDX, *Propellants, *Combustion, Temperature dependence, Information systems, Chemical reactions, Computerized simulation, Reprints.

The status of the work on the development of an evaluated gas phase chemical kinetic data base for use in the computer simulation of propellant combustion is reviewed. The author's initial efforts are aimed at the gas phase reactions in RDX decomposition. All the possible reactions involving 28 of the most likely compounds present in such systems will be considered. The work includes the collection and evaluation of mechanistic and rate information and the use of various methods for the extrapolation and estimation of rate data where information does not exist. The conditions covered range from 500-2500 K and 10 to the 17th power to 10 to the 22nd power particles/cu cm. The results of the first year's effort leads to coverage of all pertinent reactions of the following species; H, H2, H2O, O, H, OH, HCHO, CHO, CO, NO, NO2, HNO, HNO2, HCN, N2O and a number of reactions involving CN.

00,161
PB93-166478 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Chemical Kinetics Div.
Mechanisms for the Formation and Destruction of Chlorinated Organic Products of Incomplete Combustion.
Final rept.
W. Tsang. 1990, 18p.
Pub. in Combustion Science and Technology 74, n1-6 p99-116 1990.

Keywords: *Reaction kinetics, *Incinerators, *Chlorine organic compounds, *Combustion, *Waste disposal, Hazardous materials, Thermodynamic properties, Reprints, Bond energies.

The paper is concerned with the chemical kinetic basis for the formation and destruction of by-products during the incineration of hazardous wastes. Special attention is focussed on the chlorinated organics since certain classes of such compounds are frequently detected in incinerator effluents. The approach is to concentrate on single step elementary processes and to use the existing chemical kinetic data base for hydrocarbon combustion as a starting point. The authors begin by listing available thermodynamic and kinetic data bearing on the processes of importance during incineration. This information is then used to examine the possible reaction pathways. Although definitive results can only be obtained from detailed modeling, the analysis demonstrates the importance of the nature of the reaction mixture. An important variable is the ratio of hydrogen to chlorine and when this ratio is low, chlorination of unburnt hydrocarbons is an important source of undesirable side products. It is expected that PIC formation will be greatest under pyrolytic conditions. This illustrates the importance of proper mixing. Extensions to other systems are considered.

00,162
PB93-166577 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Chemical Kinetics and Thermodynamics Div.
Single Pulse Shock Tube Studies on the Thermal Decomposition of n-Butyl Phenyl Ether, n-Pentylbenzene and Phenotole and the Heat of Formation of Phenoxy and Benzyl Radicals.
Final rept.
J. A. Walker, and W. Tsang. 1990, 4p.
Pub. in Jnl. of Physical Chemistry 94, n8 p3324-3327 1990.

Keywords: *Decomposition reactions, *Ethers, *Aromatic hydrocarbons, *Free radicals, *Shock tubes, *Reaction kinetics, Heat of formation, Activation energy, Chemical bonds, Dissociation energy, Reprints.

n-Butyl phenyl ether, n-pentylbenzene and phenotole have been decomposed in single pulse shock tube experiments. The main reaction for all these processes involves bond cleavage leading to the formation of alkyl and resonance stabilized radicals. In the case of n-butyl phenyl ether decomposition, a molecular mechanism involving the direct formation of 1-butene has also been detected. The assumption that the primary C-H bond strength for butane is 421.5 kJ/mol leads to heats of formation of the phenoxy radical of 55.3 kJ/mol and that of benzyl radical, 203 kJ/mol. The A-factors for the bond cleavage reactions are all significantly higher than previously reported for analogous proc-

esses. In the case of the benzyl forming process they are now in accord with combination rates and the geometric mean rule.

00,163
PB93-173409 PC A05/MF A01
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Standard Reference Data.
NIST Standard Reference Data Products Catalog, 1993.
Special pub. (Final).
M. W. Chase, and J. C. Sauerwein. Jan 93, 87p, NIST/SP-782-ED-1993.
Supersedes PB92-149764. Also available from Supt. of Docs. as SN003-003-03192-5. See also PB92-181163.

Keywords: *Catalogs(Publications), *Data bases, Chemical analysis, Atomic physics, Biotechnology, Reaction kinetics, Molecular structure, Molecular spectroscopy, Thermophysical properties, Thermochemistry, Thermodynamics, Numerical data, Software tools, Fluids, *Standard reference data.

The National Institute of Standards and Technology's (NIST) Standard Reference Data Program provides reliable, well-documented data to scientists and engineers for use in technical problem-solving, research, and development. The catalog lists published data compilations and current databases in the Standard Reference Database Series. The edition of the catalog contains many new databases and updates current ones. These data compilations have been subdivided into eight categories. Prices and ordering information are located at the back of the document.

00,164
PB93-173417 PC A14/MF A03
National Inst. of Standards and Technology (CSTL), Boulder, CO. Thermophysics Div.
Tables of Experimental Data Used for the Correlation of the Thermophysical Properties of Ethane.
D. G. Friend, J. F. Ely, and H. Ingham. Jan 93, 306p, NISTIR-3953.

Keywords: *Ethane, *Thermophysical properties, Thermodynamic properties, Ideal gas, Tables(Data), Specific heat, Liquid phases, Transport properties, Pressure dependence, Vapor pressure, Viscosity.

The authors tabulate experimental data for the thermophysical properties of ethane from an extensive selection of the published literature. The report provides a complete tabulation of the data on ethane properties which were used in the development of correlating equations for the fluid state properties. The tables give comparisons between the correlations and the data as well as the weight which was assigned to each point in the development of the correlations. The properties include pressure and densities of the saturated liquid and vapor, the PVT relationship in the single phase, isochoric and isobaric heat capacities, sound speed, viscosity, and thermal conductivity. The general range of the data is from the triple point, near 90.4 K and 1.1 MPa, to about 625 K with pressures to about 100 MPa.

00,165
PB93-173482 PC A17/MF A04
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD.
CSTL Technical Activities 1992.
H. G. Semerjian. May 93, 395p, NISTIR-5111.

Keywords: *Research, *Chemistry, Biochemistry, Biotechnology, Chemical engineering, Reaction kinetics, Thermodynamics, Inorganic compounds, Technology transfer, Measurement, Thermophysics, Analytical techniques, Organic compounds, Surface chemistry, Processing, Microanalysis, *Chemical Science and Technology Laboratory, Standard reference materials.

The expanded responsibilities the authors were given nearly five years ago in becoming the National Institute of Standards and Technology have provided the authors with a significant challenge. The authors were instructed to more directly couple the research with industrial needs in the United States, while continuing to provide: the national system of chemical and physical measurements, the fundamental research base for tomorrow's chemical science and technology, and a national reference laboratory to address critical problems related to public health and safety. With these goals in mind, the report contains research from the Biotechnology Division; Chemical Engineering Division; Chemical Kinetics and Thermodynamics Division; Inorganic Analytical Research Division; Organic Analytical Research Division; Process Measurements Division; Surface and Microanalysis Science Division; and Thermophysics Division.

00,166
PB93-191658 PC A06/MF A02
Department of Energy, Washington, DC. Chemical Sciences Div.
EXAM: A Two-State Thermodynamic Analysis Program.
Technical note (Final).
W. H. Kirchhoff. Mar 93, 114p, NIST/TN-1401.
Also available from Supt. of Docs. as SN003-003-03209-3. Sponsored by National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Biotechnology Div.

Keywords: *Thermodynamics, *Protein denaturation, Calorimetry, Spectroscopy, Lipids, Oligonucleotides, Chemical models, Enthalpy, *EXAM computer program.

EXAM is a computer program written for the analysis of data from calorimetric or spectroscopic data on the denaturation of proteins, oligonucleotides, lipids and other macromolecules in terms of a two-state model of thermodynamic equilibrium.

00,167
PB93-196244 (Order as PB93-196228, PC A07/MF A02)
National Inst. of Standards and Technology, Gaithersburg, MD.
Optimizing Complex Kinetics Experiments Using Least-Squares Methods.
A. Fahr, W. Braun, and M. J. Kurylo. 1993, 10p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n2 p181-190 Mar/Apr 93.

Keywords: *Reaction kinetics, *Computerized simulation, Least squares method, Atmospheric chemistry, Free radicals, Experimental design, Optimization, Acuchem computer program, Methylperoxy radicals, Hydroperoxy radicals.

Complex kinetic problems are generally modeled employing numerical integration routines. The authors' kinetics modeling program, Acuchem, has been modified to fit rate constants and absorption coefficients generically to real or synthesized 'laboratory data' via a least-squares iterative procedure written for personal computers. To test the model and method of analysis the self- and cross-combination reactions of HO2 and CH3O2 radicals of importance in atmospheric chemistry are examined. These radicals as well as other species absorb ultraviolet radiation. The resultant absorption signal is measured in the laboratory and compared with a modeled signal to obtain the best-fit to various kinetic parameters. The modified program generates synthetic data with added random noise. An analysis of the synthetic data leads to an optimization of the experimental design and best-values for certain rate constants and absorption coefficients.

Polymer Chemistry

00,168
PB93-150787 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Molecular Weight Dependence of Mobility in Polymer Blends.
Final rept.
Y. Feng, C. C. Han, M. Takenaka, and T. Hashimoto. 1992, 11p.
Pub. in Polymer 33, n13 p2729-2739 1992.

Keywords: *Molecular weight, *Polymers, *Mobility, Blends, Copolymers, Light scattering, Polystyrene, Transport properties, Diffusion coefficient, Polybutadiene, Vinyl ether resins, Styrene butadiene resins, Polyisoprene, Reprints.

The molecular weight dependence of mobility in polystyrene/poly(vinyl methyl ether) blends (PS/PVME), in polybutadiene/styrene-butadiene random copolymer (PB/SBR) blends and in polyisoprene/styrene-butadiene random copolymer (PI/SBR) blends has been studied by time resolved light scattering. In the case of PS/PVME, blend samples were quenched from an initial equilibrium temperature, close to the critical temperature, to a final temperature which is deeper in the miscible region. The decay of concentration fluctuations was measured, and the interdiffusion coefficient was deduced, then mobilities were calculated. In the PB/SBR and PI/SBR blends, samples were homogenized by uniaxial compression and interdiffusion coefficients were obtained through time resolved light scattering measurement in the early stage of spinodal decomposition. It is clear from our results that mobility can be represented by the vacancy model at lower molecular weights but shows deviation towards the incompressible model at higher molecular weights. The converse can also be said. The overall molecular weight dependence of the mobility can be well represented by the Akcasu-Naegele-Klein equation.

00,169
PB93-151116 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Critical Dynamics of an Asymmetric Binary Polymer Mixture.
Final rept.
D. W. Hair, E. K. Hobbie, J. Douglas, and C. C. Han. 1992, 4p.
Pub. in Physical Review Letters 68, n16 p2476-2479, 20 Apr 92.

Keywords: *Polymer blends, Light scattering, Binary mixtures, Diffusion, Reprints, Critical dynamics.

The critical dynamics near the consolute point of a relatively low molecular weight asymmetric critical binary polymer mixture is studied with dynamic light scattering. In contrast to a single exponential decay showing a critical slowing down, as has been reported for another low molecular weight polymer blend, we observe both a 'fast' and a 'slow' relaxation rate. The critical slowing down of the concentration fluctuations is seen to be contained in these two modes.

00,170
PB93-151272 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Chain Conformation of Block Copolymers in Dilute Solutions Measured by Small-Angle Neutron Scattering.
Final rept.
Y. Matsushita, K. Shimizu, I. Noda, T. Chang, and C. C. Han. 1992, 4p.
Pub. in Polymer 33, n11 p2412-2415 1992.

Keywords: *Small angle scattering, *Block polymers, *Copolymers, *Polystyrene, Polymers, Molecular structure, Neutron scattering, Solutions, Solvents, Chemical composition, Reprints, *Molecular conformation, Poly(pyridine/vinyl).

Chain dimensions of the polystyrene-d8 parts of a styrene-d8-2-vinylpyridine block copolymer (DP-33) and a styrene-d8-styrene-h8 block copolymer (DH-44), both with 50:50 compositions, were measured in dilute solutions of pyridine (a common good solvent), benzene (a selective solvent), and methyl ethyl ketone (a poor solvent) by small-angle neutron scattering. The conformation of one block chain within a diblock copolymer is not affected by the existence of another block chain, regardless of the solvent power, at least when the composition of the diblock copolymer is 50:50, and the molecular weight is not high.

00,171
PB93-151322 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Rheometer with Two-Dimensional Area Detection for Light Scattering Studies of Polymer Melts and Solutions.
Final rept.
A. Nakatani, D. Waldow, and C. Han. 1992, 9p.
Pub. in Review of Scientific Instruments 63, n7 p3590-3598 Jul 92.

Keywords: *Rheometers, *Polymer blends, *Polymers, *Light scattering, Charge coupled devices, Two dimensional, Polybutadiene, Polystyrene, Photometers, Solutions, Melts, Reprints.

A combined rheometer and light scattering photometer has been constructed to examine the light scattering behavior of polymer melts and solutions under the influence of a simple shear field. The device uses a special lens system and a two-dimensional charge-cou-

pled device array detector, which has not been used previously in an apparatus of this type, to quantitatively measure the scattering intensity as a function of shear rate. The accessible q range of the instrument is from 3.75X10(sup -4) to 3.0X10(sup -3)/nm (2.2 deg-17.4 deg scattering angle, with lambda=632.8 nm). The rheometer uses a cone and plate geometry to generate the shear gradient and is capable of measuring torque (1.8 N m maximum) and normal forces (50 N maximum). An 8% solution of 50:50 polystyrene/polybutadiene blend in dioctyl phthalate was used to test the apparatus. This sample shows a shear-induced mixing behavior which is consistent with previous measurements by other investigators.

00,172
PB93-151330 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Marriage of Exact Enumeration and 1/d Expansion Methods: Lattice Model of Dilute Polymers.
Final rept.
A. M. Nemirovsky, K. Freed, T. Ishinabe, and J. Douglas. 1992, 26p.
Pub. in Jnl. of Statistical Physics 67, n5-6 p1083-1108 Jun 92.

Keywords: *Polymers, Partition functions, Series expansion, Enumeration, Reprints, Self-avoiding walks, Hypercubic lattices.

We consider the properties of a self-avoiding polymer chain with nearest-neighbor contact energy epsilon on a d-dimensional hypercubic lattice. General theoretical arguments enable us to prescribe the exact analytic form of the n-segment chain partition function C(n), and unknown coefficients for chains of up to 11 segments are determined using exact enumeration data in d=2-6. This exact form provides the main ingredient to produce a large-n expansion in 1/d of the chain free energy through fifth order with the full dependence on the contact energy retained. The epsilon-dependent chain connectivity constant and free energy amplitude are evaluated within the 1/d expansion to O(d(sup -5)). Our general formulation includes for the first time self-avoiding walks, neighbor-avoiding walks, theta, and collapsed chains as particular limiting cases.

00,173
PB93-151678 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Crystallographic Defects in Polymers and What They Do.
Final rept.
D. H. Reneker, and J. Mazur. 1989, 4p.
Pub. in Polymer Preprints 30, n2 p59-62 Sep 89.

Keywords: *Polyethylene, *Crystal defects, Defects(Materials), Vacancies(Crystal defects), Screw dislocations, Polymers, Reprints.

A family of 5 crystallographic defects, characterized by a defect loop that encircles one chain, were described. The present description is restricted to defects in polyethylene. This concept, however, can be applied to other crystalline polymers. The interactions of the defects with themselves and with each other are described. Interactions with larger defects of all sorts make it easier to examine the conformational and dynamical properties of vacancies, entanglements, folds, side branches, and larger edge or screw dislocation loops in the crystal. The use of these crystallographic defects to examine the nature of an entanglement in polyethylene consisting of two chains hooked together like two hairpins is described.

00,174
PB93-151785 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Free Radical Polymerization of Expandable Oxaspiro Monomers.
Final rept.
J. W. Stansbury. 1992, 33p.
Pub. in Expanding Monomers: Synthesis, Characterization, and Applications, Chapter 4, p153-185 1992.

Keywords: *Polymerization, *Free radicals, *Monomers, Molecular structure, Performance evaluation, Expansion, Reviews, Oxygen organic compounds, Reprints, *Oxaspiro compounds.

All conventional monomers are prone to varying degrees of volume contraction during polymerization. For many polymer applications, the shrinkage results in deficiencies which significantly limit the utility and performance of the resulting materials. The development of oxaspiro compounds capable of double ring-opening polymerization has allowed unique access to monomers which offer volume expansion on polymerization. Unsaturated spiro orthocarbonates and orthoesters have been utilized to obtain double ring-opening polymerization via free radical pathways. This review was compiled to document the history and current state of research involving free radical ring-opening polymerization with expansion.

00,175
PB93-151959 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Polymer Self-Diffusion in NaI-Poly(ethylene oxide) Electrolytes.
Final rept.
E. S. Wu, J. H. Shibata, and F. W. Wang. 1992, 7p.
Pub. in Polymer 33, n5 p1014-1020 1992.

Keywords: *Polyoxyethylene, *Diffusion coefficient, *Electrolytes, Temperature dependence, Phase transformations, Phase diagrams, Activation energy, Reprints, *Self diffusion.

Using the technique of fluorescence recovery after photobleaching we have measured the self-diffusion coefficients (D) of poly(ethylene oxide) (PEO) in NaI-PEO electrolytes. From the temperature dependence of the D values, the activation energy of self-diffusion was obtained. It has the same salt concentration dependence as the activation energy of ionic conductivity, suggesting that polymer segmental mobility is essential for ion transport in NaI-PEO electrolytes. The PEO diffusion rate was reduced significantly at low salt concentration, but raising the NaI concentration beyond 6 mol% resulted in only slight changes in D values. The concentration dependence of D was interpreted in terms of the interactions between PEO and sodium ions. From the response of D and the immobile fraction of PEO molecules to temperature and composition changes, several features in the NaI-PEO phase diagram were elucidated.

00,176
PB93-153526 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Phase Behavior of an Off-Critical Polymer Blend Solution during Steady Shear Studied by Small Angle Neutron Scattering.
Final rept.
A. I. Nakatani, Y. B. Ban, and C. Han. 1992, 2p.
Pub. in ACS (American Chemical Society) Polymeric Materials and Science Engineering 67, p327-328 1992.

Keywords: *Small angle scattering, *Polymers, *Phase studies, Critical point, Blends, Molecular weight, Thermodynamic properties, Steady state, Shear properties, Shear rate, Temperature, Reprints.

The behavior of critical mixtures of polymer blends under the influence of a steady shear field has been examined previously for both low and high molecular weight blends. While an understanding of behavior at or near the critical point is important, the critical composition represents only a very small portion of the entire phase diagram. However, studies of off-critical mixtures are infrequently performed. We will discuss the small angle neutron scattering behavior of an off-critical blend solution during steady shear as a function of shear rate and temperature. The apparent shift in the spinodal temperature as a function of shear rate and the critical q value where concentration fluctuations are suppressed as a function of shear rate show qualitatively different behavior than what is observed in critical mixtures. The differences in this behavior will be detailed and possible explanations for the differences in behavior will be discussed.

00,177
PB93-166197 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Synthesis and Evaluation of New Oxaspiro Monomers for Double Ring-Opening Polymerization.
Final rept.
J. W. Stansbury. 1992, 5p.
Pub. in Jnl. of Dental Research 71, n7 p1408-1412 Jul 92.

Keywords: *Polymerization, *Monomers, *Polycarbonate resins, Dental materials, Chemical bonds, Curing, Comparison, Crosslinking, Reprints, Chemical reaction mechanisms.

Polymerization with expansion in volume can be achieved with spiro orthocarbonate monomers through a double ring-opening process wherein two bonds are cleaved for each new bond formed. The resulting expansion can be applied to counter the polymerization shrinkage associated with the conventional methacrylate monomers used in dental composites and thereby provide formulations with drastically reduced degrees of shrinkage. New monomers have been prepared that exhibit enhanced reactivities and ring-opening efficiencies compared with earlier free-radical-polymerizable oxaspiro compounds. In dental composite formulations, the monofunctional oxaspiro monomers provided DTS values equivalent to those of the controls under certain curing conditions; however, only modest reductions in polymerization shrinkage were observed. 2,3-Bis(methylene)spiro orthocarbonate monomers with a conjugated diene structure were also synthesized and evaluated.

00,178
PB93-166536 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
13C NMR Studies of Polymorphy in Isotactic Polystyrene.
Final rept.
D. L. VanderHart, G. B. McKenna, and E. Perez. 1989, 2p.
See also PB89-101737.
Pub. in Polymer Preprints 30, n2 p303-304 Sep 89.

Keywords: *Nuclear magnetic resonance, *Polystyrene, *Crystal structure, *Polymorphism, Carbon 13, Isotopic labeling, Spectrum analysis, Crystallization, Crystal lattices, Gels, Reprints, Cyclooctane.

(13)C spectra taken with magic angle spinning and proton decoupling are often sensitive to the degree of organization in the solid state. It is typical that resonances associated with crystalline phases are sharper than those which arise from disordered, noncrystalline regions. Different crystalline forms produce contrasting spectra. A 3(sub1) helical chain conformation characterizes the crystals in melt crystallized isotactic polystyrene (iPS). In iPS/decalin gels ordered domains are presumed to possess the extended chain conformation, based largely on observations on dried gels. In addition, iPS will crystallize into extended chain crystals when exposed to the vapors of certain solvents like cyclohexane. In the paper, the authors report on (13)C NMR spectra of melt crystallized iPS, gels (and dried gels) of iPS in trans-decalin, and vapor-induced crystals formed in the presence of cyclooctane. Some comparison of the relative degree of order in each of these systems is possible. Also, a technique based on proton spin diffusion, will be discussed which enables one to determine if the cyclooctane is found inside the iPS crystal lattice.

CIVIL ENGINEERING

Construction Equipment, Materials, & Supplies

00,179
PB93-125904 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Analysis of the Aggregate-Cement Paste Interface Using Grazing Incidence X-ray Scattering.
Final rept.
P. J. M. Monteiro, and C. P. Ostertag. 1989, 2p.
Pub. in Cement and Concrete Research 19, n6 p987-988 Nov 89.

Keywords: *Concrete durability, *X-ray diffraction, *Substrates, Thin films, Interfaces, Nondestructive tests, Aggregates, Composite structures, Microstructure, Composition(Property), Cements, Reprints.

The grating incidence x-ray diffraction method was used to characterize the microstructure of the thin fiber that exists at the aggregate-cement paste interface where a composite specimen was used. This technique does not allow scattering from the substrate and depth profiling and permits the characterization of very thin films (angstroms thick).

00,180
PB93-139020 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Methods for Predicting Remaining Life of Concrete in Structures.
J. R. Clifton, and J. M. Pommersheim. Nov 92, 31p, NISTIR-4954.
Prepared in cooperation with Bucknell Univ., Lewisburg, PA.

Keywords: *Concrete structures, *Service life, *Estimating, *Concrete durability, Corrosion, Life(Durability), Diffusion, Mathematical models, Degradation, Reaction time, Reinforced concrete.

The ability to predict the remaining life of concrete structures is becoming increasingly important as the nation's infrastructure ages. Decisions on whether to repair or to demolish structures may depend on the estimated remaining life. Little attention has been given to developing methods for predicting remaining service lives, with most of the reported work dealing with corrosion of concrete reinforcement. These methods primarily involve the use of mathematical models and lifetime extrapolations based on corrosion current measurements. Predicting remaining service life usually involves making some type of time extrapolation from the present state of the concrete to the end-of-life state. The application of the time order concept in making time extrapolations is described in this report. Also, ways to determine the value of n (time order) in the time function t(expn) of degradation rate relationships are given. Use of the time order approach is demonstrated for n = 1/2, 1, and 2. Ways to apply the approach to cyclic processes and multi-degradation processes are also discussed. Situations may be encountered in which the remaining service life of concrete can only be estimated by predicting its original life using a service-life model. Such a situation could arise where the concrete can not be inspected or samples taken, due to its inaccessibility or to potential serious hazards involved with its inspection. An approach for applying this method is discussed.

00,181
PB93-153815 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Structures Div.
Impact-Echo Response of Plates Containing Thin Layers and Voids.
Final rept.
M. Sansalone, Y. Lin, and N. J. Carino. 1990, 8p.
Contract CES-8816688
Sponsored by National Science Foundation, Washington, DC.
Pub. In Review of Progress in Quantitative Nondestructive Evaluation, v9 p1935-1942 1990.

Keywords: *Nondestructive tests, *Concrete structures, *Plates(Structural members), Impact tests, Stress analysis, Inspection, Voids, Wave propagation, Concrete durability, Finite element method, Reprints, *Impact-echo method.

A technique called impact-echo has been developed for nondestructive testing of concrete structures. The method is based on the interaction of impact-generated stress waves with internal discontinuities and specimen boundaries. This paper summarizes the results of finite element studies performed to investigate the feasibility of using the method for the inspection of civil structures containing thin layers of acoustically dissimilar materials and voids. Axisymmetric models of layered plates subject to point impact were analyzed. The numerical solutions indicated that a void below a thin layer could be detected by the impact-echo method. The analytical conclusions were verified by experimental results obtained from concrete specimens containing grouted and ungrouted tendon ducts. It was shown that the impact-echo method could readily distinguish between grouted and ungrouted metal or plastic tendon ducts.

00,182
PB93-157451 PC A04/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Applicability of the Maturity Method to High-Performance Concrete.
N. J. Carino, L. I. Knab, and J. R. Clifton. May 92, 67p, NISTIR-4819.
See also PB85-189199 and PB91-143321. Sponsored by Federal Highway Administration, McLean, VA. Office of Engineering and Highway Operations Research and Development, and Corps of Engineers, Washington, DC.

Keywords: *High strength concretes, *Curing, *Compressive strength, Concrete durability, Mixtures, Temperature effects, Mechanical properties, Regression analysis, Specifications, Mathematical models.

The study examines whether the maturity method is applicable to represent the strength development of high-performance concrete mixtures cured at different temperatures. Two mortar mixtures were investigated having water to cementitious solids ratios of 0.29 and 0.36. The mixtures were made with Type I cement, silica fume (10% by mass of cement), and a high-range water reducing admixture. Ten batches of mortar were prepared to make cube specimens, which were cured under water at three temperatures: 7, 23, and 40 C. Compression strengths were measured at ages ranging from 5 hours to 139 days. The strength-age data were analyzed using three models to determine the rate constant for strength development at each curing temperature. The models included two hyperbolic equations (linear and parabolic) and an exponential equation. The rate constant versus curing temperature relationship for each model was represented by a simple exponential equation, which was used to convert test ages to equivalent ages of curing at 23 C. The strength development of the various mortar batches could be described by a single equation relating relative strength to equivalent age. Thus it was concluded that the maturity method is applicable to describe strength development of the low water-cement ratio mixtures. It was also observed that the estimated long-term strength of the batches did not appear to be affected by the curing temperature. This is in direct contrast with the known behavior of conventional concrete mixtures.

00,183
PB93-159051 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Computer Model for the Diffusion and Binding of Chloride Ions in Portland Cement Paste.
D. P. Bentz, and E. J. Garboczi. Feb 93, 26p, NISTIR-5125.
See also PB91-187690 and PB92-126598.

Keywords: *Binding, *Chlorides, *Portland cements, Ionization, Adsorption, Chemical reactions, Mathematical models, Digital simulation, Microstructure, Diffusion, Hydration, Electron microscopes, *Cement pastes.

A two-dimensional computer model has been developed to simulate the diffusion and binding of chloride ions in cement paste. The model is based on a random walk algorithm in which chloride species randomly diffuse throughout the cement paste microstructure and interact with various phases of the paste. Reaction with unhydrated C3A and C4AF and adsorption by the C-S-H gel phase are the two binding processes included in the model. Input to the model is a digital image of cement paste microstructure which can be obtained from a real cement sample or from a digital-image-based microstructure model. The operation of the diffusion and binding model is demonstrated on pastes made from two cements whose differing compositions are captured by combining backscattered electron and x-ray images obtained using a scanning electron microscope. These initial images are 'hydrated' using the microstructure model to produce final images to be utilized as input into the diffusion model. Chloride concentration profiles are generated for both the binding and no-binding cases for both microstructures for times of up to several hours after exposure to the chloride.

00,184
PB93-166247 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Building Materials Div.
Standard Aggregate Materials for Alkali-Silica Reaction Studies.
Final rept.
L. J. Struble, and M. Brockman. 1989, 5p.
See also PB89-193221.
Pub. in Proceedings of the International Conference on Alkali-Aggregate Reaction (8th), Kyoto, p433-437 1989.

Keywords: *Aggregates, *Alkali aggregate reactions, *Mortars(Material), Cements, Concrete durability, Glass, Limestone, Sands, Silicate cements, Silicon dioxide, Chemical reactions, Reprints.

Preliminary studies were carried out to identify candidate materials that may be used in place of Pyrex glass as a standard reactive aggregate in alkali-silica investigations. The various candidate materials were tested for expansion in mortars prepared using either a high-alkali or a low-alkali cement, a nonreactive limestone sand, and some reactive material. The reactive aggregates studied included several commercial glasses, an opal, and a calcined flint. The proportion of limestone replaced by each reactive material was varied so as to bracket the pessimum level of each material. Mortar-bar expansion levels were measured over periods of approximately 6 months to 2 years. Based on these studies, four of the materials are identified as potential candidates as standard reactive materials in mortar-bar expansion studies: Vycor, fused quartz, fused silica, and calcined flint; the calcined flint appears especially promising.

00,185
PB93-166254 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Building Materials Div.
Standard Cement Clinkers for Phase Analysis.
Final rept.
P. Stutzman, S. Lenker, H. Kanare, L. Strubble, F. Tang, and D. Campbell. 1989, 15p.
Pub. in Proceedings of the International Conference on Cement Microscopy (11th), New Orleans, LA., April 10-13, 1989, p154-168.

Keywords: *Clinker, *Image analysis, *Microscopy, X-ray diffraction, Portland cements, Standards, Porosity, Test methods, Crystal structure, Crystallography, Reprints.

Three portland cement clinkers with known phase abundance have been produced. The clinkers provide standard materials that may be used in developing and testing techniques for quantitative phase analysis. The clinkers are available as research materials; they may later be issued as Standard Reference Materials after additional analyses. The clinkers have been analyzed using reflected light microscopy, scanning electron microscopy and X-ray powder diffraction. In this paper, the authors describe the fabric (i.e., porosity, mineralogy, crystal type, size, morphology and distribution) of each clinker, and the phase abundance determined using each method.

00,186
PB93-178630 PC A07/MF A02
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Performance of Electromagnetic Covermeters for Nondestructive Assessment of Steel Reinforcement.
Final rept.
N. J. Carino. Dec 92, 131p, NISTIR-4988.

Keywords: *Reinforcing steels, *Reinforced concrete, *Eddy current tests, Concrete durability, Nondestructive tests, Electromagnetic tests, Electromagnetic fields, Eddy currents, Experimental data, *Covermeters.

Covermeters are electromagnetic devices for locating steel reinforcing bars in concrete structures. An experimental study was carried out to compare the basic characteristics of two types of commercial covermeters (magnetic reluctance and eddy current). Experiments were carried out using single bars and multiple bars with various configurations. One group of single-bar tests studied the relationships between meter reading and cover thickness. Empirical equations were fitted to the data, and the values of the equation parameters were found to be relatively insensitive to the bar size. The other group of single-bar tests examined the relationship between meter reading and horizontal distance between the meter probe and the bar axis (offset). Data were fitted with a bell shaped, quadratic exponential function. The parameter characterizing the decay of the meter reading with offset was found to depend on the cover in a well-defined manner. The parameter was used to characterize the differences in the influence zones of the probes. Tests with multiple, parallel bars were conducted to determine the critical spacings below which the location of the individual bars could not be discerned and below which the meter amplitude exceeded the single-bar value. A simple summation model was used to predict the response based on the individual-bar response.

00,187
PB93-198885 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Highway Concrete (HWYCON) Expert System Requirements and Installation Guide.
L. J. Kaetzel. May 93, 32p, NISTIR-5190.

Keywords: *Concretes, *Expert systems, *Highway maintenance, *Information systems, Concrete durability, Road materials, Pavement condition, Bridge decks, Maintenance management, Concrete pavements, Pavement damage.

A computerized system that contains knowledge about materials related activities for highway concrete structures has been developed. The system, named HWYCON (HighWaY CONcrete), was developed by the National Institute of Standards and Technology in Gaithersburg, MD. HWYCON was developed for the Strategic Highway Research Program's Project C-206, 'Optimization of Highway Concrete Technology'. The knowledge contained in HWYCON consists of facts, rules of thumb, photographs, drawings, and bibliographic references. The system is designed to assist highway departments in diagnosing distresses, selecting materials, and making repair and rehabilitation decisions related to highway concrete pavements, bridge decks, and bridge substructures. The document was written to identify the contents of the HWYCON implementation package, and to provide information on the requirements and installation of the computerized system.

00,188
PB94-111424 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Computational Materials Science of Cement-Based Materials: An Education Module.
Technical note.
D. P. Bentz, E. J. Garboczi, and R. T. Coverdale.
Aug 93, 46p, NIST/TN-1405.
Also available from Supt. of Docs. as SN003-003-03229-8. See also PB92-148253. Prepared in cooperation with Northwestern Univ., Evanston, IL.

Keywords: *Cements, *Hydration, *Microstructure, *Computerized simulation, *Education, Manuals, Porosity, Porisimeters, Materials, Civil engineering, Software(Computers).

An education module demonstrating the principles of computational materials science has been developed. The module consists of: software that executes on a personal computer, and this NIST Technical Note, which provides documentation and instructions for using the computer software. The computer programs are available for both DOS-compatible PC and Macintosh computing environments. Four separate computer programs illustrate the development of microstructure during cement hydration, mercury intrusion porosimetry, percolation of overlapping ellipses and rectangles as a function of aspect ratio, and percolation of non-overlapping hard cores each encompassed by a soft overlapping shell.

00,189
PB94-112802 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Calculating Cement Paste and Mortar Diffusivity from Conductivity Measurements: Preliminary Results of a New Method.
K. A. Snyder, and J. R. Clifton. Oct 93, 16p, NISTIR-5235.
See also PB89-215362 and PB91-187690.

Keywords: *Reinforced concrete, *Reinforcing steels, *Diffusivity, *Conductivity, *Concrete durability, Service life, Impedance, Water cement ratio, Spectroscopy, Mathematical models, Test methods, Cements, Mortars(Materials), Chlorine ions, Corrosion.

A method to determine the chloride diffusivity of concrete is being developed which is both expeditious and accurate. The method is based upon the Nernst-Einstein equation relating conductivity and diffusivity. Results from a single measurement can be used to calculate the diffusivity for any specified ion, given the 'free' diffusivity of that ion. The experimental procedure, along with preliminary results, are reported.

Highway Engineering

00,190
PB93-134104 PC A19/MF A04
National Inst. of Standards and Technology, Gaithersburg, MD.
Proceedings of the U.S.-Japan Workshop on Seismic Retrofit of Bridges (1st). Held in Tsukuba Science City, Japan on December 17-18, 1990.
1990, 443p.
See also PB93-134112.

Keywords: *Earthquake damage, *Meetings, *Reinforcement(Structure), *Highway bridges, Bridge peirs, Reinforced concrete, Japan, Failure, United States, Seismic effects, Bridge inspection, Design analysis, Structural engineering, Bridges(Structures), Bridge design, Ductility, Structural steels, California, Earthquake engineering, Damage assessment, Earthquakes, *Loma Prieta Earthquake, San Francisco(California).

Contents: History of Seismic Damage and Preparation of Selsmic Design Codes; Damage to San Francisco Bridges in the Loma Prieta Earthquake; Assessment and Prioritization of Vulnerable Bridges; Inspection and Strengthening Methods for Reinforced Concrete Bridge Piers; Research on Seismic Retrofitting and Strengthening of Reinforced Concrete Bridge Piers; Research on Seismic Retrofitting and Strengthening.

00,191
PB93-134112 (Order as PB93-134104, PC A19/MF A04)
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Building and Fire Research Lab.
Overview of Damage to Highway Bridges during the Loma Prieta Earthquake.
H. S. Lew. 1992, 30p.
Included in Proceedings of the U.S.-Japan Workshop on Seismic Retrofit of Bridges (1st), Tsukuba Science City, Japan, December 17-18, 1990, p111-139.

Keywords: *Highway bridges, *Earthquake damage, Damage assessment, Earthquakes, Bridge inspection, Earthquake engineering, Bridges(Structures), California, Seismic effects, Viaducts, Dynamic response, Structural engineering, Design analysis, *Loma Prieta Earthquake, San Francisco(California).

At 5:04 p.m., Pacific Daylight Time, on October 17, 1989, an earthquake with a surface-wave magnitude of 7.1 occurred with its epicenter located about 10 miles (15 km) northeast of Santa Cruz and 60 miles (95 km) south-southeast of San Francisco, California. According to the U.S. Geological Survey, the earthquake ruptured a segment of the San Andreas fault below the Santa Cruz Mountains. The hypocenter was about 11 miles (18 km) beneath the Earth's surface, and the rupture propagated about 25 miles (40 km) both northwest and southeast within a 10-second period. The earthquake was felt over an area of 400,000 square miles (1,000,000 sq km), from Los Angeles to the south, Oregon to the north, and western Nevada to the east. This earthquake, named the Loma Prieta earthquake, was the largest on the San Andreas fault since the great San Francisco earthquake of 1906 (M = 8.3) when a 275-mile (440-km) stretch of the fault ruptured. The report presents an overview of damage to highway bridge structures during the earthquake.

Soil & Rock Mechanics

00,192
PB93-158343 PC A05/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Effect of Subsurface Conditions on Earthquake Ground Motions.
F. Y. Yokel. Jan 93, 95p, NISTIR-4769.

Keywords: *Earth movements, *Soil properties, *Selsmic waves, Earthquakes, Dynamic response, Wave propagation, Earthquake engineering, Spectra analysis, Mathematical models, Soil profiles, Shear strain, Loma Prieta Earthquake, Oakland(California).

The revised version of the SHAKE program was prepared and used to study the effects of subsurface conditions on the earthquake ground motion in the Loma Prieta earthquake. Preliminary soil profile data from the sites of the Oakland Outer Harbor Wharf and Apeel 2 strong motion stations are used to calculate ground motions, which are then compared with the recorded ground motions using response spectra calculated for a 5% damping ratio. Parameters affecting the amplitude of the calculated ground motion are examined. Response Spectra for recorded and calculated ground motions are compared with recommended design spectra (NEHRP, 1988). It is shown that for periods less than 1.4 s the response spectra for recorded far source earthquake motions at Oakland Wharf and Apeel 2 fall outside the envelope of the applicable design spectra, and that response spectra for deeper soil profiles calculated for near source conditions exceed the design spectra by a considerable margin. Design spectra for the San Francisco Bay region, recently proposed in a USGS study, are reasonably close to the calculated near source spectra for deeper soil profiles for periods less than 1 s, but they are conservative for the bedrock motion, and extremely conservative for longer period structures.

00,193
PB93-178606 PC A05/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Estimating Soil Parameters Important for Lifeline Siting Using System Identification Techniques.
S. Glaser. Mar 93, 96p, NISTIR-5143.

Keywords: *Soil dynamics, *Liquefaction, *Earthquakes, Pipelines, Power lines, Railroads, Roads, Telecommunication, Strain measurement, Seismic waves, Mathematical models, Earthquake engineering, System identification.

Liquefaction causes a large portion of all damage done by earthquakes. The damage is especially severe to lifeline structures such as pipelines. The report examines the state-of-the-art of the application of System Identification (SI) methods to the liquefaction problem, with special attention to lifelines. System identification is seen as the best way to ascertain large strain soil properties in situ. A thorough introduction to SI methods and spectral analysis is given. The traditional Fourier-based methods are found to be inexact since the sample variance is equal to the sample mean if averaging techniques are not used. There is an additional problem since earthquake signals are not stationary. Autoregressive-moving average models are seen as a better analysis method, especially the newer adaptive methods that are designed for non-stationary signals.

00,194
PB93-178614 PC A06/MF A02
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Estimating In situ Liquefaction Potential and Permanent Ground Displacements Due to Liquefaction for the Siting of Lifelines.
S. Glaser. Mar 93, 108p, NISTIR-5150.

Keywords: *Liquefaction, *Earth movements, *Sands, *Earthquake resistant structures, Displacement, Soil mechanics, Seismic waves, Mathematical models, Earthquakes, Soil properties.

The report examines the state-of-the-art of two aspects of the liquefaction problem with special attention to lifelines. In situ methods of estimating liquefaction potential are studied, since it is believed to be impossible to test in the laboratory an 'undisturbed' sample of loose sand, which is most susceptible to liquefaction. The state-of-practice is the SPT-based method championed by Seed, although the velocity-based predictors have a stronger physical basis. The Spectral Analysis of Surface Waves technique is especially suited for examining the large areal extents of lifeline routes. The state-of-the-art for estimating permanent ground displacements is purely empirical. Several methods are examined, and they all appear to have equal predictive abilities - within a factor of four. There have been a few recent attempts to construct constitutive models for post-liquefaction displacements, but at the time they are in formative stages and have not been rigorously proven.

COMBUSTION, ENGINES, & PROPELLANTS

Combustion & Ignition

00,195
DE93003631 PC A04/MF A01
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Process Measurements Div.
Particulate and droplet diagnostics in spray combustion. Annual report.
Progress rept.
H. G. Semerjian, and C. Presser. Sep 91, 58p, DOE/CE/90213-T7.
Contract AI01-86CE90213
Sponsored by Department of Energy, Washington, DC.

Keywords: *Combustion, *Droplets, Alcohols, Atomization, Flames, Interferometry, Methanol, Progress Report, Research Programs, Size, Sprays, Velocity, EDB/400800.

During the past year, significant progress was made in four different areas: (a) measurement of droplet velocity distributions and time of arrival, (b) time-resolved measurement of droplet size with the ESPR technique, (c) study of the structure of methanol/dodecanol spray flames, and (d) comparison of droplet sizing techniques. Droplet velocity distributions and time of arrival were obtained with a single-component laser velocimetry system to obtain detailed information on the transport of individual droplets. The polarization ratio technique is being developed to obtain time resolved droplet sizes and number density in nonburning sprays. Droplet size and velocity measurements were obtained with phase/Doppler interferometry for different mixtures of methanol and dodecanol to ascertain evidence of the occurrence of microexplosions in this two-component fueled spray flame. Finally, a comparative analysis of droplet-size and number density was carried out in a pressure-atomized spray using three droplet sizing techniques (i.e., ESPR, PDI and LID).

00,196
DE93003632 PC A04/MF A01
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Chemical Process Metrology Div.
Particulate and droplet diagnostics in spray combustion. Annual report.
Progress rept.
H. G. Semerjian, and C. Presser. Apr 90, 58p, DOE/CE/90213-T6.
Contract AI01-86CE90213
Sponsored by Department of Energy, Washington, DC.

Keywords: *Combustion, *Droplets, *Sprays, Flames, Interferometry, Progress Report, Research Programs, Size, Velocity, *Fuels, EDB/400800.

During the past year, significant progress was made in three different areas: measurement of droplet velocity distributions, applications of the polarization ratio sizing technique, and studies of fuel property effects on spray flame structure. Droplet velocity distributions were obtained with a single-component laser velocimetry system to obtain detailed information on the transport of individual droplets. The polarization ratio technique is being developed to obtain instantaneous droplet sizes in nonburning and burning sprays. Droplet size and velocity measurements were obtained with phase/Doppler interferometry for four different fuels to ascertain the influence of physical properties of fuels on the size, number density and velocity of droplets found in spray flames.

00,197
DE93007989 PC A02/MF A01
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD.
Time-based ensemble scattering measurements in fuel sprays.
J. R. Zurlo, C. Presser, A. K. Gupta, and H. G. Semerjian. 1991, 6p, CONF-911099-2.
Contract AI01-86CE90213
Eastern section of the Combustion Institute fall technical meeting: chemical and physical processes in combustion, Ithaca, NY (United States), 14-16 Oct 1991. Sponsored by Department of Energy, Washington, DC.

Keywords: *Sprays, *Light Scattering, *Meetings, Combustion, Density, Droplets, Gas Turbines, Herbicides, Kerosene, Particle Size, Pesticides, Rocket Engines, *Fuel sprays, EDB/400800, EDB/400102, EDB/661200.

Knowledge of droplet size in sprays is important for spray combustion, pesticide and herbicide spraying, spray cooling, fire sprinklers, and many other industrial applications. The importance of measuring and evaluating time-varying information in sprays can be critical to the performance of these spray systems. For example, gas turbine and rocket motor stability is dependent on suppression of combustor frequencies which alter the atomization characteristics of the spray. High-speed movies of the atomization process have shown that steady sprays are not uniform in time but can contain clusters of droplets. Droplet clustering may have significant ramifications in combustion applications for soot production. Another time-dependent phenomenon observed in airblast-atomized sprays is a rapid change in spray angle known as fluttering. To study such phenomena, an ensemble light scattering technique was used to obtain time-resolved information on droplet mean size and number density in sprays where similar temporal features have been observed.

00,198
PB93-146702 PC A12/MF A03
Virginia Polytechnic Inst. and State Univ., Blacksburg.
Generation of Carbon Monoxide in Compartment Fires.
Doctoral thesis.
D. T. Gottuk. Dec 92, 266p, NIST/GCR-92/619.
Grant 60NANB1D1176
Sponsored by National Inst. of Standards and Technology, Gaithersburg, MD.

Keywords: *Carbon monoxide, *Fire tests, *Solid fuels, *Combustion products, Reaction kinetics, Wood, Oxidation, Hexanes, Polyurethane, Plumes, Theses, *Compartment fires.

A test compartment was used to investigate the burning of four fuels (hexane, PMMA, spruce, and flexible polyurethane foam) in compartment fires. Empirical correlations between the upper-layer yield of major species and the plume equivalence ratio were shown to exist. The results reveal that the production of CO is primarily dependent on the compartment flow dynamics and upper layer temperature. A chemical kinetic analysis indicated that increased compartment temperature affects upper-layer species yields in two ways: (1) the generation of species in the plume is changed, and (2) oxidation of post-flame gases in the layer is affected. The correlations developed in the compartment fires were qualitatively similar to those developed by Beyler for simplified upper-layer environments. The species yields downstream of hexane compartment fires were investigated and compared to upper-layer yields. Results showed that downstream CO yields can be correlated to the plume equivalence ratio when taking into account the occurrence of external burning.

00,199
PB93-149029 Not available NTIS
American Chemical Society, Washington, DC.
Journal of Physical and Chemical Reference Data, Volume 21, No. 3, May/June 1992.
Bimonthly rept.
D. R. Lide. c1992, 343p.
See also PB93-149037 and PB93-148997. Prepared in cooperation with American Inst. of Physics, New York. Sponsored by National Inst. of Standards and Technology, Gaithersburg, MD.
Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Physical properties, *Chemical properties, *Physical chemistry, Combustion kinetics, Reaction kinetics, Vapor phases, Gases, Thermodynamics, Chemical reactions, Tables(Data), Listings, *Reference materials.

Contents: Evaluated Kinetic Data for Combustion Modelling.

00,200
PB93-149037 Not available NTIS
Leeds Univ. (England).
Evaluated Kinetic Data for Combustion Modelling.
D. L. Baulch, C. J. Cobos, R. A. Cox, T. Just, J. A. Kerr, M. J. Pilling, J. Troe, R. W. Walker, J. Warnatz, C. Esser, and P. Frank. c1992, 323p.
Prepared in cooperation with Goettingen Univ. (Germany, F.R.). Inst. fuer Physikalische Chemie, Natural Environment Research Council, Swindon (England), Stuttgart Univ. (Germany, F.R.). Inst. fuer Technische Verbrennung, and Deutsche Forschungsanstalt fuer Luft- und Raumfahrt e.V., Stuttgart (Germany, F.R.). Included in Jnl. of Physical and Chemical Reference Data, v21 n3 p411-734 May/Jun 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Combustion kinetics, *Reaction kinetics, *Vapor phases, Tables(Data), Gases, Chemical reactions, Thermodynamics.

The compilation contains critically evaluated kinetic data on elementary homogeneous gas phase chemical reactions for use in modelling combustion processes. Data sheets are presented for some 196 reactions. Each data sheet sets out relevant thermodynamic data, rate coefficient measurements, an assessment of the reliability of the data, references, and recommended rate parameters. Tables summarizing the preferred rate are also given. The reactions considered are limited largely to those involved in the combustion of methane and ethane in air but a few reactions relevant to the chemistry of exhaust gases and to the combustion of aromatic compounds are also included.

00,201
PB93-182038 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Programmer's Reference Guide to FDMS File Formats.
Internal rept.
R. W. Portier. Apr 93, 45p, NISTIR-5162.

Keywords: *Fire tests, *Data bases, *Information systems, Data processing, Calorimeters, Combustion, Management systems, Fires, Information retrieval, Data retrieval, *Fire Data Management System.

Fire Data Management System, FDMS, is a computer database specifically designed to store and retrieve fire test results. The guide provides detailed descriptions of the current, beta version, file formats as well as revisions planned for the immediate future.

00,202
PB93-183952 PC A18/MF A04
Swedish Fire Research Board, Stockholm.
International Conference on Fire Suppression Research (1st): Proceedings. Held in Stockholm and Boras, Sweden on May 5-8, 1992.
V. Sjolin, D. D. Evans, and N. H. Jason. Sep 92, 412p.
See also PB93-124964. Sponsored by Department of Commerce, Washington, DC. Technology Administration.

Keywords: *Fire extinguishers, *Research, *Fire fighting, *Meetings, Fire protection, Combustion, Fire extinguishing agents, Sprinklers, Fire tests, International relations, *Foreign technology.

The conference was the first one to be entirely devoted to fire suppression research and from the beginning it was decided to have a broad program. Scientists, sponsors, and users were represented. To provide an environment that would enhance information exchange, the number of participants was limited to approximately thirty people. The conference goals were to: present ongoing or recently conducted research; present views on what type of projects, types of suppression research, etc., should be undertaken in the future; rank future research needs; stimulate an exchange of knowledge and provide a foundation for continuing this exchange in the future. To achieve these goals, the organizers invited individuals representing a broad range of technical expertise, experience, and responsibility in their respective organizations from around the world to submit abstracts. The response was overwhelming. Representatives from Canada, Finland, Germany, Norway, Sweden, United Kingdom and the United States were able to participate.

00,203
PB93-198893 PC A03/MF A01

Michigan State Univ., East Lansing. Dept. of Mechanical Engineering.
Extinguishment of Combustible Porous Solids by Water Droplets.
Annual progress rept.
A. Atreya. Apr 93, 30p, NIST/GCR-93/621.
Grant 60NANB8D0861
Sponsored by National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.

Keywords: *Fire extinguishing agents, *Diffusion flames, *Infrared photography, Polymethyl methacrylate, Infrared photography, Water, Fire safety, Research management.

Two experimental configurations are chosen for the study: (1) Stagnation-point flow apparatus: which allows studying both the gas-phase and the condensed-phase suppression actions and enables transient chemical measurements in the exhaust gas. These measurements are used to study the suppression mechanisms and quantify the suppression effectiveness. (2) Counterflow diffusion flame apparatus: which allows detailed flame structure measurements but is limited to studying gas-phase suppression mechanisms (chemical and/or physical).

00,204
PB93-200889 PC A04/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Fire Science Div.
RADCAL: A Narrow-Band Model for Radiation Calculations in a Combustion Environment.
Technical note.
W. L. Grosshandler. Apr 93, 57p, NIST/TN-1402.
Also available from Supt. of Docs. as SN003-003-03215-8.

Keywords: *Radiative heat transfer, *Computer programs, *Emissivity, *Absorption spectra, *Combustion, Spectral emittance, Radiant flux density, Spectrum analysis, Soot, Combustion products, Wavelengths, *RADCAL computer program.

Radiation within a medium containing products of combustion is dependent upon the temperature and concentrations throughout the entire field. The energy is distributed across the infrared spectrum in a highly nonlinear fashion, which greatly complicates modeling of the heat transfer within a burning environment. The report describes a numerical program, RADCAL, which predicts the radiant intensity leaving a nonisothermal volume containing nonuniform levels of carbon dioxide, water vapor, methane, carbon monoxide, nitrogen, oxygen, and soot. The absorption coefficient of the combined gases is calculated from a narrow-band model, and a combination of tabulated spectral properties and theoretical approximations to the vibrational-rotational molecular bands. Soot is treated as a purely absorbing substance in the Rayleigh limit. Background on the development of the model, example calculations, and an explanation of input procedures are presented.

00,205
PB94-121324 PC A10/MF A03
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Fire Safety Engineering Div.
Annual Conference on Fire Research, 1993: Book of Abstracts.
W. J. Duffin. Oct 93, 212p, NISTIR-5280.
Presented at the NIST Annual Conference on Fire Research, Rockville, MD., October 18-20, 1993. See also PB83-155887 and PB93-188845.

Keywords: *Buildings, *Research projects, *Fires, *Bibliographies, Combustion, Computerized simulation, Mathematical models, Building codes, Construction materials, Fire protection, Fire resistance, Smoke, Fire detection systems, Meetings, Fire safety.

The NIST Annual Conference on Fire Research has long been a prime forum for presentation and discussion of the latest advances in fire science and engineering. The conference includes mostly fire research performed within Federal laboratories, or sponsored by Federal agencies. However, some private sector and foreign fire research is also included. This year's conference focuses on the development, verification of fire safety engineering tools, and their application to building fires, transportation fires, underground fires, and large fires. This will enable scientists and engineers to describe recent work on fire models and measurement methods and users to describe experiences and limitations in the use of these tools.

COMMUNICATION

Common Carrier & Satellite

00,206
FIPS PUB 174 PC E19
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Federal Building Telecommunications Wiring Standard: Category: Telecommunications Standard; Subcategory: Cables and Wiring.
Final rept.
S. M. Radack, and A. G. Hanson. 21 Aug 92, 92p.
Prepared in cooperation with National Communications System, Arlington, VA.
Three ring vinyl binder also available: North American Continent price $7.00; all others write for quote.

Keywords: *Telecommunication, *Federal information processing standards, *Commercial buildings, *Wire, Copper, Fiber optics, Data processing equipment, Design standards, Specifications.

The standard specifies minimum requirements for telecommunications wiring within a building and between buildings in a campus environment. It specifies a wiring system with a recommended topology and recommended distances. It specifies copper and optical-fiber transmission media by parameters that determine performance, and specifies connectors and their pin assignments to ensure interconnectability. The standard recognizes a background precept of fundamental importance: to have a building successfully designed and provisioned for telecommunications, it is imperative that the telecommunications wiring design be incorporated during the preliminary architectural design phase.

00,207
FIPS PUB 175 PC E19
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Federal Building Standard for Telecommunications Pathways and Spaces; Category: Telecommunications Standard; Subcategory: Cables and Wiring.
Final rept.
S. M. Radack, and A. G. Hanson. 21 Aug 92, 126p.
Prepared in cooperation with National Communications System, Arlington, VA.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Telecommunication, *Federal information processing standards, *Office buildings, *Passage ways, Design standards, Wire, Communication equipment, National government.

The standard specifies minimum requirements for telecommunications pathways and spaces within a Federal office building and between office buildings in a campus environment. The standard recognizes a background precept of fundamental importance: to have a building successfully designed, constructed, and provisioned for telecommunications, it is imperative that the telecommunications design be incorporated during the preliminary architectural design phase.

00,208
FIPS PUB 176 PC E13
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Residential and Light Commercial Telecommunications Wiring Standard; Category: Telecommunications Standard; Subcategory: Cables and Wiring.
Final rept.
S. M. Radack, and A. G. Hanson. 21 Aug 92, 58p.
Prepared in cooperation with National Communications System, Arlington, VA.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Telecommunication, *Federal information processing standards, *Residential buildings, *Wire, Design standards, Wiring, Data processing equipment, Requirements.

The standard gives an overview of premises wiring, and specifies installation requirements and component technical requirements. Appendices to the industry standard provide information on line assignments in selected network interface jacks, wiring installation guidelines, component description, and references to related standards and other documents.

00,209
FIPS PUB 178 PC A02
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Video Teleconferencing Services at 56 to 1,920 KB/S. Category: Telecommunications Standard and Subcategory: Video Teleconferencing.
Final rept.
S. M. Radack, and G. M. Rekstad. 21 Dec 92, 10p.
Prepared in cooperation with National Communications System, Washington, DC. Office of Technology and Standards.

Keywords: *Teleconferencing, *Video communication, *Standards, National government, Government policies, *FIPS(Federal Information Processing Standard).

The standard, by adoption of International Telegraph and Telephone Consultative Committee (CCITT) Recommendations H.320, H.221, H.242, H.261, and H.230, defines the specifications for video teleconferencing and video telephony systems. The document provides Federal departments and agencies a comprehensive description of the interoperability criteria for audiovisual systems used in video teleconferencing and videophone applications.

00,210
PB93-149433 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
Study of Traffic Control and Congestion Control in Broadband ISDN.
Y. D. Chang, and D. H. Su. Dec 92, 42p, NISTIR-5000.

Keywords: *Traffic control, *Data transmission, *Telecommunication, Multiplexing, Modulation, Traffic management, Standards, Communications management, Switching systems, Network synthesis, *Broadband Integrated Services Digital Network, Asynchronous Transfer Mode.

In Broadband Integrated Services Digital Network (B-ISDN), the Asynchronous Transfer Mode (ATM) network architecture has been adopted as the switching and multiplexing scheme. One of the important ATM architectural issues is the traffic/congestion control. Numerous schemes, algorithms and theories have been studied in the area of network flow control, congestion control, and traffic control in order to seek suitable techniques to manage network traffic effectively to meet the quality of service requirement for network users. Among B-ISDN terminals in a Customer Premises Network (CPN) domain, a new flow control concept referred to as Generic Flow Control (GFC), has been adopted and its protocol standardization is under study. The main purpose of GFC is to control and to schedule the local traffic flow at the Broadband Terminal Equipment (B-TEs) at an early stage before the traffic is transmitted into the network. This will have a significant role in the overall performance of high speed network traffic management.

00,211
PB93-173391 PC A11/MF A03
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
North American ISDN (Integrated Services Digital Network) Users' Forum Agreements on ISDN.
Special pub. (Final).
D. P. Stokesberry, K. M. Roberts, and T. Antonishek. Jan 93, 241p, NIST/SP-823/3.
Also available from Supt. of Docs. as SN003-003-03197-6. See also PB92-102219.

Keywords: *Telecommunication, Communication networks, Digital communications, Telephone systems, Specifications, Agreements, *Foreign technology, *Integrated Services Digital Network, Basic rate Interface, Primary rate interface, Application profiles.

The document compiles the existing NIU-Forum agreements for an ISDN developed and approved in the NIU-Forum as of October 1991. These agreements cover: Layer 1 BRI at the U, and S/T reference points; Layer 1 PRI at the U/S/T reference points; Layer 2 BRI and PRI; Layer 3 BRI Basic Call Control for Class I

equipment; Layer 3 PRI Basic Call Control for Class II equipment; and Generic Control procedures for Class I BRI Supplementary Services. In addition, the document references the Conformance tests which have been completed by the NIU-Forum. These include: Layer 1 BRI S/T interface; and Layer 2 BRI LAPD. Finally, the document contains the Application Profiles for: four of the Incoming Call Management applications; the Building Controls application; the Data Conferencing - Point-to-Point application; the ISDN Station Event Recording application; and three of the Voice Messaging System applications which have been submitted to the NIU-Forum.

00,212
PB94-100880 PC A04/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Private Branch Exchange (PBX) Security Guideline.
7 Sep 93, 72p, NIST/GCR-93/635.
See also AD-A207 905 and AD-A255 422.

Keywords: *Telecommunications, *Security, Telephones, Switching systems, Instructions, *PBX(Private Branch Exchange).

Telecommunication digital switch technology has advanced rapidly in the last few years. While the topic of mainframe and table top computer security has received much attention the last 20 years, the security capability of telecommunications hardware and software, specially the Private Branch Exchange (PBX) has not kept pace. The purpose of the document is to describe the basic concepts of PBX security.

00,213
PB94-120920 PC A99/MF E11
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
Integrated Services Digital Network Conformance Testing. Layer 2, Data Link Layer (LAPD). Part 1, Basic Rate Interface, User Side.
Special pub. (Final).
D. P. Stokesberry, L. Collica, and K. M. Roberts. Sep 93, 1137p, NIST/SP-823-4.
Also available from Supt. of Docs. as SN003-003-03221-2. See also PB92-181114.

Keywords: *Communication networks, Communication equipment, Data links, Digital communications, Computer networks, Specifications, Standards, Tables(Data), *ISDN(Integrated Services Digital Network), *Integrated Services Digital Network, Basic rate interface, Conformance testing, CCITT recommendations.

This document defines the abstract test specifications to verify conformance of equipment to the Layer 2, Data Link Layer, Link Access Procedure on the D Channel (LAPD) of an Integrated Services Digital Network (ISDN) at the user-side of the user-network interface, for the Basic Rate Interface (BRI) access arrangements, as defined in the International Telegraph and Telephone Consultative Committee (CCITT) Recommendation Q.921 and American National Standard ANS T1.602. The test scripts are written in the internationally standardized Tree and Tabular Combined Notation, TTCN. These tests were developed, internationally harmonized, and approved by members of the North American ISDN Users' Forum (NIU/91-0012).

Policies, Regulations, & Studies

00,214
PB93-151926 Not available NTIS
National Inst. of Standards and Technology (PL), Boulder, CO. Time and Frequency Div.
AT2, a New Time Scale Algorithm: AT1 Plus Frequency Variance.
Final rept.
M. A. Weiss, and T. Weissert. 1991, 10p.
Pub. in Metrologia 28, p65-74 1991.

Keywords: *Time measurement, Kalman filters, Variance(Statistics), Reprints, Frequency step detection, AT2 algorithm.

The existing AT1 algorithm produces a time scale with a fractional frequency variation smaller than that of any clock in the ensemble. We are developing a modification to AT1 that includes the additional desirable features: automatic frequency-step detection, the option to run in an optimal post-processing mode and to run with minimal supervision in non-technical environments. These properties are facilitated by the inclusion of a Kalman-filter estimate of the frequency variance of each clock in the scale. Results are reported from both simulated and real clock data to demonstrate automatic frequency-step detection.

Verbal

00,215
PB93-173938 PC A05/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
DARPA TIMIT Acoustic-Phonetic Continous Speech Corpus CD-ROM. NIST Speech Disc 1-1.1.
J. S. Garofolo, L. F. Lamel, W. M. Fisher, N. L. Dahlgren, J. G. Fiscus, and D. S. Pallett. Feb 93, 85p, NISTIR-4930.
See also PB91-505065.

Keywords: *Speech recognition, *Speech corpora, *Dialects, Phonetics, Linguistics, Verbal communication, English language, Documentation, *American English.

The Texas Instruments/Massachusetts Institute of Technology (TIMIT) corpus of read speech has been designed to provide speech data for the acquisition of acoustic-phonetic knowledge and for the development and evaluation of automatic speech recognition systems. TIMIT contains speech from 630 speakers representing 8 major dialect divisions of American English, each speaking 10 phonetically-rich sentences. The TIMIT corpus includes time-aligned orthographic, phonetic, and word transcriptions, as well as speech waveform data for each spoken sentence. The release of TIMIT contains several improvements over the Prototype CD-ROM released in December, 1988: (1) full 630-speaker corpus, (2) checked and corrected transcriptions, (3) word-alignment transcriptions, (4) NIST SPHERE-headered waveform files and header manipulation software, (5) phonemic dictionary, (6) new test and training subsets balanced for dialectal and phonetic coverage, and (7) more extensive documentation.

COMPUTERS, CONTROL & INFORMATION THEORY

General

00,216
FIPS PUB 180 PC E03
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Secure Hash Standard. Category: Computer Security.
11 May 93, 25p.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Computer security, *Federal information processing standards, Message processing, Data processing security, Cryptology, Data encryption, Digital signatures.

The standard specifies a Secure Hash Algorithm (SHA) which can be used to generate a condensed representation of a message called a message digest. The SHA is required for use with the Digital Signature Algorithm (DSA) as specified in the Digital Signature Standard (DSS) and whenever a secure hash algorithm is required for Federal applications. The SHA is used by both the transmitter and intended receiver of a message in computing and verifying a digital signature.

00,217
FIPS PUB 181 PC E05
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Automated Password Generator (APG). Category: Computer Security.
5 Oct 93, 58p.
See also FIPS PUB 46-1.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Access control, *Federal information processing standards, Authentication, Computer security, Identification systems, Random number generators, Data encryption, Computer programs, *Passwords.

This publication specifies a standard to be used by Federal organizations that require computer generated pronounceable passwords to authenticate the personal identity of an automated data processing (ADP) system user, and to authorize access to system resources. The standard describes an automated password generation algorithm that randomly creates simple pronounceable syllables as passwords. The password generator accepts input from a random number generator based on the Data Encryption Standard (DES) cryptographic algorithm defined in Federal Information Processing Standard 46-1 (FIPS PUB 46-1).

00,218
PB93-138956 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Computer Security Div.
Assessing Federal and Commercial Information Security Needs.
D. F. Ferraiolo, D. M. Gilbert, and N. Lynch. Nov 92, 45p, NISTIR-4976.

Keywords: *Data processing security, Standards, Computer information security, Requirements, Access control, National government, Commercial sector, *IT(Information Technology), EDI(Electronic Data Interchange).

The study assesses the current and future information technology (IT) security needs of the commercial, civil, and military sectors. The primary objectives were to: determine a basic set of information protection policies and control objectives that pertain to the secure processing needs of organizations within all sectors; and identify protection requirements and technical approaches that are used, desired or sought so they can be considered for future federal standards and guidelines. The findings of the study address the basic security needs of IT product users, including system developers, end users, administrators, and evaluators. Security needs have been identified based on actual existing and well-understood security organizational practices.

00,219
PB93-146025 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Automated Tools for Testing Computer System Vulnerability.
Final rept.
W. T. Polk. Dec 92, 42p, NIST/SP-800/6.
Also available from Supt. of Docs. as SN003-003-03187-9.

Keywords: *Computer security, *Vulnerability, *Tests, Access control, Debugging(Computers), Software tools, Artificial intelligence.

The document discusses automated tools for testing computer system vulnerability. By analyzing factors affecting the security of a computer system, a system manager can identify common vulnerabilities stemming from administrative errors. Using automated tools, this process may examine the content and protections of hundreds of files on a multi-user system and identify subtle vulnerabilities. By acting on this information, system administrators can significantly reduce their systems' security exposure. Automated vulnerability testing tools are available for a wide variety of systems. Some tools are commercially available; others are available from other system administrators. Additional tools may be developed to address specific concerns for an organization's computer systems. The document examines basic requirements for vulnerability testing tools and describes the different functional classes of tools. Finally, the document offers

general recommendations about the selection and distribution of such tools.

00,220
PB93-151579 PC A10/MF A03
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Computer Security Div.
Study of OSI Key Management.
R. Zamparo. Nov 92, 223p, NISTIR-4983.

Keywords: *Computer security, *Computer networks, Cryptography, Secure communication, Data encryption, Models, Protocols, *Key management, OSI(Open Systems Interconnection), ASN1(Abstract Syntax Notation One).

For communications between computer systems to be useful in many environments, the systems and their communications must be secure. One prerequisite to secure communications is the management of keying material needed by the underlying cryptographic mechanisms that provide security. The report addresses key management as it applies to communications protocols based on the Open Systems Interconnection (OSI) architecture. It contains a criteria and model of OSI key management that allows schemes based on both secret key and public key crytography to be incorporated. The report reviews significant issues of OSI key management and presents a generic protocol that resolves a majority of them. The abstract syntax notation (ASN.1) is used to specify the protocol. An example of how registration of ASN.1 protocol modules can be used to support algorithm specific security objects is also given.

00,221
PB93-152049 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Guide to the Selection of Anti-Virus Tools and Techniques.
Special pub.
W. T. Polk, and L. E. Bassham. Dec 92, 49p, NIST/SP-800/5.
Also available from Supt. of Docs. as SN003-003-03188-7. See also PB90-115601.

Keywords: *Computer viruses, *Software tools, Computer security, Data integrity, Personal computers, Monitors, Error detection codes, Accuracy, Access control, Knowledge bases(Artificial intelligence), Virus removal.

Computer viruses continue to pose a threat to the integrity and availability of computer systems. This is especially true for users of personal computers. A variety of anti-virus tools are now available to help manage this threat. These tools use a wide range of techniques to detect, identify, and remove viruses. The guide provides criteria for judging the functionality, practicality, and convenience of anti-virus tools. It does not weigh the merits of specific tools, however it forms a basis with which readers can then evaluate which tools are best suited to target environments.

00,222
PB93-166148 Not available NTIS
National Inst. of Standards and Technology (NCSL), Gaithersburg, MD. Computer Security Div.
Token Based Access Control System for Computer Networks.
Final rept.
M. Smid, J. Dray, and R. B. J. Warnar. 1989, 1922p.
Pub. in Proceedings of National Computer Security Conference (12th), 'Information Systems Security: Solutions for Today - Concepts for Tomorrow', Gaithersburg, MD., June 30, 1989, p232-253.

Keywords: *Access control, *Computer security, Computer networks, Data encryption, Random number generators, Data storage, Reprints, Smart tokens.

The paper describes a Token Based Access Control System (TBACS) developed by the Security Technology Group of the National Institute of Standards and Technology (NIST). TBACS replaces traditional password based access control systems which have often failed to prevent logins by unauthorized parties. A user's access to network computers and resources is mediated by a smart token implementing a transparent cryptographic three-way handshake with the target computer. The token's onboard processor and memory are exploited to provide sophisticated security mechanisms in a portable device. In addition to access control, the TBACS token may be used for random number generation, cryptographic key generation, data encryption, data authentication, and secure data storage.

00,223
PB93-185999 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Minimum Security Requirements for Multi-User Operating Systems.
Mar 93, 50p, NISTIR-5153.

Keywords: *Computer security, *Requirements, *Operating systems(Computers), Identifying, Authentication, Access control, Data integrity, Product development, Auditing, Reliability, MSR(Minimum Security Requirements), TCSEC(Trusted Computer System Evaluation Criteria), ITSEC(Information Technology Security Evaluation Criteria).

The Minimum Security Requirements for Multi-User Operating Systems (MSR) document provides basic commercial computer system security requirements applicable to both government and commercial organizations. These requirements include technical measures that can be incorporated into multi-user, remote-access, resource-sharing, and information-sharing computer systems. The MSR document was written from the prospective of protecting the confidentiality and integrity of an organization's resources and promoting the continual availability of these resources. The MSR presented in the document form the basis for the commercially oriented protection profiles in Volume II of the draft Federal Criteria for Information Technology Security document. The MSR document has been developed by the MSR Working Group of the Federal Criteria Project under National Institute of Standards and Technology (NIST) leadership with a high level of private sector participation. Its contents are based on the Trusted Computer System Evaluation Criteria (TCSEC) C2 criteria class, with additions from current computer industry practice and commercial security requirements specifications.

00,224
PB93-188134 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
Optimization of Adaptive Resonance Theory Network with Boltzmann Machine.
O. M. Omidvar, and C. L. Wilson. Apr 93, 15p, NISTIR-5176.
Prepared in cooperation with District of Columbia Univ., Washington. Dept. of Computer Science.

Keywords: *Optimization, Algorithms, Character recognition, Neural nets, Combinatorial analysis, Machine learning, Feature extraction, *Adaptive Resonance Theory, *Boltzmann machine.

Optimization of large neural networks is essential in improving the network speed and generalization power, while at the same time reducing the training error and the network complexity. Boltzmann methods have been used as a statistical method for combinatorial optimization and for the design of learning algorithms. In the networks studied, the Adaptive Resonance Theory (ART) serves as a connection creation operator and the Boltzmann method serves as a competitive connection annihilation operator. By combining these two methods it is possible to generate small networks that have similar testing and training accuracy and good generalization from small training sets. The findings demonstrate that for a character recognition problem the number of weights in a fully connected network can be reduced by over 80%. The authors have applied the Boltzmann criteria to differential pruning of the connections which is based on the weight contents rather than on the number of connections.

00,225
PB93-228682 PC A05/MF A01
Iowa State Univ., Ames. Dept. of Computer Science.
Report of the NSF/NIST Workshop on NSFNET/NREN Security. Held on July 6-7, 1992.
A. E. Oldehoeft, and D. K. Branstad. May 93, 88p, NISTIR-5232.
Sponsored by National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Computer Security Div., and National Science Foundation, Washington, DC.

Keywords: *Meetings, *Computer security, *Computer networks, Authentication, Access control, Management, Computer privacy, Electronic mail, Distributed computer systems, Recommendations, NREN(National Research and Education Network), NSFNET(National Science Foundation Network).

The report summarizes the results of a workshop on security sponsored by the National Science Foundation (NSF) and the National Institute of Standards and Technology (NIST). The primary goals were to develop a set of recommendations for near-term security solutions for the NSF network (NSFNET) with special emphasis on the supercomputer centers and enhancing the security of the networks developed under the National Research and Education Network (NREN) Program. Sessions were held on four primary topics in security: (1) authentication; (2) access control; (3) application security; and (4) security management. The participants included representatives of government, industry, academia and international interests in security. The principal output of the workshop is a set of recommendations for improved authentication, access control, privacy enhanced mail, and security management.

00,226
PB94-101854 PC A07/MF A02
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Workshop on Security Procedures for the Interchange of Electronic Documents: Selected Papers and Results.
Final rept.
R. G. Saltman. Aug 93, 128p, NISTIR-5247.

Keywords: *Meetings, *Computer security, Documents, Data processing security, Risk analysis, Law(Jurisprudence), Commerce, Computer applications, Health care, Costs, Environmental protection, Authentication, Requirements, Policy making, *EDI(Electronic Data Interchange).

Contents:
- Linking Security and the Law of Computer-Based Commerce;
- Balanced Electronic Data Interchange Security;
- The Need for Risk Analysis;
- Health Care Perspective on Security Procedures for EDI;
- On the Optimal Expenditure of Computer Security Costs;
- The Legal Viability of Electronically Submitted Environmental Compliance Reports;
- Authenticity and Assurance;
- What Price Data Security;
- Security Requirements and Evidentiary Issues in the Interchange of Electronic Documents: Steps Toward Developing a Security Policy.

00,227
PB94-102258 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Towards Flexible Distributed Information Retrieval.
D. W. Flater, and Y. Yesha. Aug 93, 25p, NISTIR-5243.

Keywords: *Information retrieval, *Computer networks, *User needs, Information dissemination, Data transmission, Data retrieval, Data bases, Information systems, Real time systems, Natural language, Query languages, Data base management.

Many years of research into better and more effective information retrieval methods have yielded a collection of good information retrieval techniques. Careful use of these techniques can result in an information retrieval system that can answer high-level queries with surprising accuracy when the domain of discourse is small. At the same time, the growth of wide-area networks, and the corresponding growth in the amount of information available through them, has caused many archives and information bases to become lost in a great connectionless cloud. Without prior knowledge of site names and access methods, users are often unable to make contact with potentially useful information bases. To make the best use of networked resources, it is necessary to increase the amount of cooperation between network sites. By allowing sites to share the responsibility of routing requests for data and caching replicas of frequently used data, it is possible to eliminate the inefficiencies resulting from the isolation of individual sites and users. However, the system must remain flexible enough to allow the integration of existing information bases.

Computer Hardware

00,228
N93-14778/3 (Order as N93-14771/8, PC A13/MF A03)
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Status of Emerging Standards for Removable Computer Storage Media and Related Contributions of NIST.
F. L. Podio. Sep 92, 25p.
In NASA. Goddard Space Flight Center, Nssdc Conference on Mass Storage Systems and Technologies for Space and Earth Science Applications, Volume 3 25 p.

Keywords: *Computer storage devices, *Data storage, *Magnetic tapes, *Optical disks, *Standards, Digital data, Errors, Life (Durability).

Standards for removable computer storage media are needed so that users may reliably interchange data both within and among various computer installations. Furthermore, media interchange standards support competition in industry and prevent sole-source lock-in. NIST participates in magnetic tape and optical disk standards development through Technical Committees X3B5, Digital Magnetic Tapes, X3B11, Optical Digital Data Disk, and the Joint Technical Commission on Data Permanence. NIST also participates in other relevant national and international standards committees for removable computer storage media. Industry standards for digital magnetic tapes require the use of Standard Reference Materials (SRM's) developed and maintained by NIST. In addition, NIST has been studying care and handling procedures required for digital magnetic tapes. NIST has developed a methodology for determining the life expectancy of optical disks. NIST is developing care and handling procedures for optical digital data disks and is involved in a program to investigate error reporting capabilities of optical disk drives. This presentation reflects the status of emerging magnetic tape and optical disk standards, as well as NIST's contributions in support of these standards.

00,229
PB93-181873 PC A05/MF A02
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Computer Systems Laboratory Annual Report, 1992.
E. B. Lennon, S. M. Radack, and R. K. Roach. Feb 93, 100p, NISTIR-5127.
See also report for 1991, PB92-172709.

Keywords: *Computers, *Computer software, Information systems, Systems engineering, Computer security, Computer networks, Computer architecture, Technology transfer, Telecommunication, Federal information processing standards, Computer Systems Laboratory, National Institute of Standards and Technology.

The Computer Systems Laboratory (CSL) Annual Report-1992 describes the annual computer and related telecommunications activities and accomplishments of the Laboratory. Following the Director's Foreword, an overview of the Laboratory is presented, including a current CSL Organization Chart. Overviews of CSL's five technical divisions are featured next, followed by a section on Technology Transfer which details the vehicles CSL uses to disseminate research and information to the public and technical communities. A list of Federal Information Processing Standards (FIPS) and FIPS order information conclude the annual report.

00,230
PB93-234730 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Operating Principles of the VME MultiKron Interface Board.
A. Mink, J. W. Roberts, and J. K. Antonishek. Aug 93, 17p, NISTIR-5233.
See also PB92-181072. Sponsored by Defense Advanced Research Projects Agency, Arlington, VA.

Keywords: *Computer systems hardware, *Very large scale Integration, Multiprocessors, Printed circuits, Circuit boards, Computer architecture, Multiple-instruction multiple data(MIMD), Multi Kron interface board(MIB), National Institute of Standards and Technology.

The MultiKron Experimenter's Toolkit contains the VME MultiKron interface board (MIB), installation software, data logging software, and analysis software; all of the software supplied is written in C. The Toolkit allows users to take advantage of the National Institute of Standards and Technology (NIST) MultiKron performance measurement chip in systems that do not already have a MultiKron designed into them. The MIB is applicable to both multiprocessor systems and single-processor systems. The Experimenter's Toolkit allows researchers to obtain hands-on experience with the MultiKron performance measurement chip, without the engineering effort required to design and build a hardware interface between the MultiKron and their computer. Up to one million Trace Samples can be collected during an experiment to the MIB on-board memory; a practically-unlimited number of Samples can be collected if an optional external data-collection computer is used.

Computer Software

00,231
AD-A262 055/7 PC A16/MF A03
National Inst. of Standards and Technology, Gaithersburg, MD.
Validation Summary Report: GTE Government Systems, Alsys Ada Software Development Environment, HP 9000 Series 800 Model 867 Under HP-UX BLS Version A.08.08 (Host and Target), 930115S1.11307.
Final rept. 15 Jan 93.
1993, 375p.

Keywords: *Compilers, *Ada programming language, Standards, Installation, *Validation summary reports, Computer program verification.

This Validation Summary Report describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A and FIPS PUB 119. This report explains all technical terms used within it and reports the results of testing this compiler using the Ada Compiler Validation Capability. An Ada compiler must be implemented according to the Ada Standard, and any implementation-dependent features must conform to the requirements of the Ada Standard. The Ada Standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard. Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between implementations. The Ada Standard permits some implementation dependencies--for example, the maximum length of identifiers or the maximum values of integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or implementation strategies. All the dependencies observed during the process of testing this compiler are given in this report. The information in this report is derived from the test results produced during validation testing and from the Ada compiler vendor. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results.

00,232
AD-A262 056/5 PC A16/MF A03
National Inst. of Standards and Technology, Gaithersburg, MD.
Validation Summary Report: GTE Government Systems, Alsys Ada Software Development Environment, HP 9000 Series 800 Model 867 Under HP-UX BLS Version A.08.08 (Host and Target), 930115S1.11308.
Final rept. 15 Jan 93.
15 Jan 93, 375p.

Keywords: *Compilers, *Ada programming language, Standards, Installation, *Validation summary reports, Computer program verification.

This Validation Summary Report describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A and FIPS PUB 119. This report explains all technical terms used within it and reports the results of testing this compiler using the Ada Compiler Validation Capability. An Ada compiler must be implemented according to the Ada Standard, and any Implementation-dependent features must conform to the requirements of the Ada Standard. The Ada Standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard. Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between implementations. The Ada Standard permits some implementation dependencies--for example, the maximum length of identifiers or the maximum values of integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or implementation strategies. All the dependencies observed during the process of testing this compiler are given in this report. The information in this report is derived from the test results produced during validation testing and from the Ada compiler vendor. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results.

00,233
AD-A262 253/8 PC A17/MF A03
National Inst. of Standards and Technology, Gaithersburg, MD.
Validation Summary Report: GTE Government Systems, Alsys Ada Software Development Environment, HP 9000 Series 800 Model 807 UnderHP-UX BLS Version A.08.08 (Host and Target), 930115S1.11305.
Final rept.
15 Jan 93, 380p.

Keywords: *Compilers, *Ada programming language, Installation, Standards, *Validation summary reports, Computer program verification.

This Validation Summary Report describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A and FIPS PUB 119. This report explains all technical terms used within it and reports the results of testing this compiler using the Ada Compiler Validation Capability. An Ada compiler must be implemented according to the Ada Standard, and any Implementation-dependent features must conform to the requirements of the Ada Standard. The Ada Standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard. Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between Implementations. The Ada Standard permits some implementation dependencies--for example, the maximum length of Identifiers or the maximum values of Integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or Implementation strategies. All the dependencies observed during the process of testing this compiler are given in this report. The information in this report is derived from the test results produced during validation testing and from the Ada compiler vendor. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results.

00,234
AD-A262 717/2 PC A16/MF A03
National Inst. of Standards and Technology (NCSL), Gaithersburg, MD. Software Standards Validation Group.
Validation Summary Report: GTE Government Systems, Alsys Ada Software Development Environment, HP 9000 Series 800 Model 817 under HP-UX BLS Version A.08.08 (Host and Target), 930115S1.11306.
Final rept.
15 Jan 93, 375p.

Keywords: *Compilers, *Ada programming language, Standards, Test and evaluation, *Validation summary reports, Computer program verification.

This Validation Summary Report describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A and FIPS PUB 119. This report explains all technical terms used within it and reports the results of testing this compiler using the Ada Compiler Validation Capability. An Ada compiler must be implemented according to the Ada Standard, and any Implementation-dependent features must conform to the requirements of the Ada Standard. The Ada Standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard. Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between Implementations. The Ada Standard permits some implementation dependencies--for example, the maximum length of identifiers or the maximum values of Integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or Implemen-

tation strategies. All the dependencies observed during the process of testing this compiler are given in this report. The information in this report is derived from the test results produced during validation testing and from the Ada compiler vendor. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results.

00,235
AD-A262 720/6 PC A05/MF A01
National Inst. of Standards and Technology (NCSL), Gaithersburg, MD. Software Standards Validation Group.
Validation Summary Report: GTE Government Systems, Aisys Ada Software Development Environment for 80386 UNIX, Version 5.1.2, Zenith Data Systems, Z-Station 433 DEh (Host and Target), 930115S1.11309.
Final rept.
15 Jan 93, 91p.

Keywords: *Compilers, *Ada programming language, Standards, Test and evaluation, *Validation summary reports, Computer program verification.

This Validation Summary Report describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A and FIPS PUB 119. This report explains all technical terms used within it and thoroughly reports the results of testing this compiler using the Ada Compiler Validation Capability. An Ada compiler must be implemented according to the Ada Standard, and any implementation-dependent features must conform to the requirements of the Ada Standard. The Ada Standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard. Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between implementations. The Ada Standard permits some implementation dependencies--for example, the maximum length of identifiers or the maximum values of integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or implementation strategies. All the dependencies observed during the process of testing this compiler are given in this report. The information in this report is derived from the test results produced during validation testing and from the Ada compiler vendor. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results.

00,236
AD-A264 885/5 PC A05/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Validation Summary Report: Digital Equipment Corporation, DEC Ada for Open VMS AXP Systems, Version 3.0-5, DEC 3000 Model 400 (host target), 930319S1.11315.
Final rept.
19 Mar 93, 79p, NIST93DEC505-1-1.11.

Keywords: *Compilers, *Ada programming language, Computer program verification, Test and evaluation, Standards, *Validation summary reports.

This Validation Summary Report describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A and FIPS PUB 119. This report explains all technical terms used within it and reports the results of testing this compiler using the Ada Compiler Validation Capability. An Ada compiler must be implemented according to the Ada Standard, and any implementation-dependent features must conform to the requirements of the Ada Standard. The Ada Standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard. Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between implementations. The Ada Standard permits some implementation dependencies--for example, the maximum length of identifiers or the maximum values of integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or implementation strategies. All the dependencies observed during the process of testing this compiler are given in this report. The information in this report is derived from the test results produced during validation testing and from the Ada compiler vendor. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results. The purpose of validating is to ensure conformity of the compiler to the Ada Standard by testing that the compiler properly implements legal language constructs and that it identifies and rejects illegal language constructs. The testing also identifies behavior that is implementation-dependent but is permitted by the Ada Standard. Six classes of tests are used.

00,237
AD-A264 886/3 PC A05/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Validation Summary Report: Digital Equipment Corporation, DEC Ada for Open VMS VAX Systems, Version 3.0-7, VAXstation 4000 Model 60 (host) => VAXstation 3100 Model 48 (target), 930319S1.11317.
Final rept.
19 Mar 93, 79p, NIST93DEC505-3-1.11.

Keywords: *Ada programming language, *Compilers, Computer program verification, Test and evaluation, Military requirements, Standards, Computer files, Magnetic tape, *Validation summary reports, ANSI/MIL-STD-1815A.

No abstract available.

00,238
AD-A265 014/1 PC A05/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Validation Summary Report: Digital Equipment Corporation, DEC Ada for OpenVMS VAX Systems, Version 3.0-7, VAXstation 4000 Model 60 (host target), 930319S1.11316.
Final rept.
19 Mar 93, 78p.

Keywords: *Compilers, *Ada programming language, Standards, *Validation summary reports, Computer program verification.

This Validation Summary Report describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A and FIPS PUB 119. This report explains all technical terms used within it and reports the results of testing this compiler using the Ada Compiler Validation Capability. An Ada compiler must be implemented according to the Ada Standard, and any implementation-dependent features must conform to the requirements of the Ada Standard. The Ada Standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard. Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between implementations. The Ada Standard permits some implementation dependencies--for example, the maximum length of identifiers or the maximum values of integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or implementation strategies. All the dependencies observed during the process of testing this compiler are given in this report. The information in this report is derived from the test results produced during validation testing and from the Ada compiler vendor. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results.

00,239
AD-A265 260/0 PC A05/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Ada Compiler Validation Summary Report. Certificate Number: 920918S1.11272, U.S. Navy Ada/M, Version 4.5 (/OPTIMIZE) VAX 8550/8600/8650 (Cluster) > Enhanced Processor (EP) AN/UYK-44 (Bare Board).
Final rept.
18 Sep 92, 89p, NIST92USN500-3-1.11.

Keywords: *Ada programming language, *Compilers, Assembly languages, Computer communications, Naval research, *Validation summary reports, AN/UYK-44, Standards, Computer program verification.

U.S. Navy, Ada/M, Version 4.5 (/OPTIMIZE), VAX 8550/8600/8650 (Cluster), (running VAX/VMS Version 5.3)(host) to Enhanced Processor (EP) AN/UYK-44 (Bare Board)(Target), ACVC 1.11.

00,240
AD-A265 433/3 PC A05/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Ada Compiler Validation Summary Report. Certificate Number: 920805S1.11265 DDC-I, Inc. DACS Sun SPARC/SunOs Native Ada Compiler System, Version 4.6.1 SPARCStation 2 => SPARCStation 2.
Final rept.
6 Oct 92, 77p.

Keywords: *Compilers, *Ada programming language, Standards, *Validation summary reports, Computer program verification.

This Validation Summary Report describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A and FIPS PUB 119. This report explains all technical terms used within it and reports the results of testing this compiler using the Ada Compiler Validation Capability. An Ada compiler must be implemented according to the Ada Standard, and any implementation-dependent features must conform to the requirements of the Ada Standard. The Ada Standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard. Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between implementations. The Ada Standard permits some implementation dependencies--for example, the maximum length of identifiers or the maximum values of integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or implementation strategies. All the dependencies observed during the process of testing this compiler are given in this report. The information in this report is derived from the test results produced during validation testing and from the Ada compiler vendor. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results.

00,241
AD-A265 434/1 PC A05/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Ada Compiler Validation Summary Report. Certificate Number: 920918S1.11273 U.S. Navy, Ada/M, Version 4.5 (OPTIMIZE), VAX 8550/8600/8650 (Cluster) => VHSIC Processor Module (VPM) AN/AYK-14 (Bare Board).
Final rept.
27 Oct 92, 88p.

Keywords: *Compilers, *Ada programming language, Standards, *Validation summary reports, Computer program verification.

This Validation Summary Report describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A and FIPS PUB 119. This report explains all technical terms used within it and reports the results of testing this compiler using the Ada Compiler Validation Capability. An Ada compiler must be implemented according to the Ada Standard, and any implementation-dependent features must conform to the requirements of the Ada Standard. The Ada Standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard. Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between implementations. The Ada Standard permits some implementation dependencies--for example, the maximum length of identifiers or the maximum values of integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or implementation strategies. All the dependencies observed during the process of testing this compiler are given in this report. The information in this report is derived from the test results produced during validation testing and from the Ada compiler vendor. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results.

00,242
AD-A265 435/8 PC A05/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.

Computer Software

Ada Compiler Validation Summary Report. Certificate Number: 920918S1.11274 U.S. Navy Ada/M, Version 4.5 (/NO OPTIMIZE) VAX 8550/8600/8650 (Cluster) => Enhanced Processor (EP) AN/UYK-44 (Bare Board).
Final rept.
27 Oct 92, 90p.

Keywords: *Compilers, *Ada programming language, Standards, *Validation summary reports, Computer program verification.

This Validation Summary Report describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A and FIPS PUB 119. This report explains all technical terms used within it and reports the results of testing this compiler using the Ada Compiler Validation Capability. An Ada compiler must be implemented according to the Ada Standard, and any implementation-dependent features must conform to the requirements of the Ada Standard. The Ada Standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard. Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between implementations. The Ada Standard permits some implementation dependencies--for example, the maximum length of identifiers or the maximum values of integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or implementation strategies. All the dependencies observed during the process of testing this compiler are given in this report. The information in this report is derived from the test results produced during validation testing and from the Ada compiler vendor. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results.

00,243
AD-A265 437/4 PC A05/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Ada Compiler Validation Summary Report. Certificate Number: 920918S1.11275 U.S. Navy Ada/M, Version 4.5 (/NO OPTIMIZE) VAX 8550/8600/8650 (Cluster) => VHSIC Processor Module (VPM) AN/AYK-14 (Bare Board).
Final rept.
27 Oct 92, 88p.

Keywords: *Compilers, *Ada programming language, Standards, *Validation summary reports, Computer program verification.

This Validation Summary Report describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A and FIPS PUB 119. This report explains all technical terms used within it and reports the results of testing this compiler using the Ada Compiler Validation Capability. An Ada compiler must be implemented according to the Ada Standard, and any implementation-dependent features must conform to the requirements of the Ada Standard. The Ada Standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard. Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between implementations. The Ada Standard permits some implementation dependencies--for example, the maximum length of identifiers or the maximum values of integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or implementation strategies. All the dependencies observed during the process of testing this compiler are given in this report. The information in this report is derived from the test results produced during validation testing and from the Ada compiler vendor. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results.

00,244
AD-A265 600/7 PC A04/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.

Ada Compiler Validation Summary Report. Certificate Number: 920805S1.11263 DDC-I, Inc. DACS MIPS RISC/os to MIPS R3000 Bare Ada Cross Compiler System, Release 2.1-16, MIPS M/120-5 => Lockheed Sanders STAR MVP R3010 Board.
Final rept.
5 Aug 92, 56p.

Keywords: *Compilers, *Ada programming language, Standards, *Validation summary reports, Computer program verification.

This Validation Summary Report describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A and FIPS PUB 119. This report explains all technical terms used within it and reports the results of testing this compiler using the Ada Compiler Validation Capability. An Ada compiler must be implemented according to the Ada Standard, and any implementation-dependent features must conform to the requirements of the Ada Standard. The Ada Standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard. Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between implementations. The Ada Standard permits some implementation dependencies--for example, the maximum length of identifiers or the maximum values of integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or implementation strategies. All the dependencies observed during the process of testing this compiler are given in this report. The information in this report is derived from the test results produced during validation testing and from the Ada compiler vendor. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results.

00,245
AD-A265 601/5 PC A07/MF A02
National Inst. of Standards and Technology, Gaithersburg, MD.
Ada Compiler Validation Summary Report. Certificate Number: 920805S1.11264 DDC-I, Inc. DACS DECstation/ULTRIX to MIP R3000 Bare Ada Cross Compiler System, Release 2.1-16 DECStation 3100 => Integrated Device Technology IDT7RS301 R3000/R3010 Board.
Final rept.
5 Aug 92, 145p.

Keywords: *Compilers, *Ada programming language, Standards, *Validation summary reports, Computer program verification.

This Validation Summary Report describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A and FIPS PUB 119. This report explains all technical terms used within it and reports the results of testing this compiler using the Ada Compiler Validation Capability. An Ada compiler must be implemented according to the Ada Standard, and any implementation-dependent features must conform to the requirements of the Ada Standard. The Ada Standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard. Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between implementations. The Ada Standard permits some implementation dependencies--for example, the maximum length of identifiers or the maximum values of integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or implementation strategies. All the dependencies observed during the process of testing this compiler are given in this report. The information in this report is derived from the test results produced during validation testing and from the Ada compiler vendor. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results.

00,246
AD-A265 602/3 PC A04/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.

Ada Compiler Validation Summary Report. Certificate Number: 920918S1.11270 U.S. NAVY AdaAX, Version 5.5 (/OPTIMIZE) VAXstation 4000 =Z> VAXstation 4000.
Final rept.
18 Sep 92, 74p.

Keywords: *Compilers, *Ada programming language, Standards, *Validation summary reports, Computer program verification.

This Validation Summary Report describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A and FIPS PUB 119. This report explains all technical terms used within it and reports the results of testing this compiler using the Ada Compiler Validation Capability. An Ada compiler must be implemented according to the Ada Standard, and any implementation-dependent features must conform to the requirements of the Ada Standard. The Ada standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard. Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between implementations. The Ada Standard permits some implementation dependencies--for example, the maximum length of identifiers or the maximum values of integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or implementation strategies. All the dependencies observed during the process of testing this compiler are given in this report. The information in this report is derived from the test results produced during validation testing and from the Ada compiler vendor. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results.

00,247
FIPS PUB 161-1 PC E01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Electronic Data Interchange (EDI): Category: Software Standard; Subcategory: Electronic Data Interchange.
Final rept.
R. G. Saltman. 19 Apr 93, 11p.
Supersedes FIPS PUB 161.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Data transmission, Electronics, Telecommunication, Businesses, *Federal Information Processing Standards, *EDI(Electronic Data Exchange).

The publication announces the adoption, as a Federal Information Processing Standard, of recognized national and international standards for EDI. In EDI, data that would be traditionally conveyed on paper documents are transmitted or communicated electronically according to established rules and formats. The data that are associated with each type of functional document, such as a purchase order or invoice, are transmitted together as an electronic message. The formatted data may be transmitted from originator to recipient via telecommunications or physically transported on electronic storage media.

00,248
FIPS-PUB-179 PC E04
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Government Network Management Profile (GNMP). Category: Hardware and Software Standards. Subcategory: Computer Network Protocols.
Federal information processing standards (Final).
K. M. Hsing. 14 Dec 92, 50p.
Three ring vinyl binder also available, North American Continent price $8.00; all others write for quote.

Keywords: *Systems management, *Computer networks, Standards, Protocol(Computers), Specifications, *Government Network Management Profile, *Computer network protocols, *Hardware and software standards, Federal Information Processing Standard Publication 179, Open systems interconnection, Federal standard 179.

The Federal Information Processing Standard adopts the Version 1.0 GNMP. The Government Network Management Profile (GNMP) specifies the common management information exchange protocol and services, specific management functions and services, and the syntax and semantics of the management informa-

tion required to support monitoring and control of the network and system components and their resources. The GNMP builds on FIPS 146-1, Government Open Systems Interconnection Profile (GOSIP), and includes the GOSIP Version 2.0 by reference. The GOSIP specifies lower layers protocols and three applications that support general network management operations. Future versions of the GNMP will add network management functions and services for GOSIP-compliant end systems and intermediate systems. The GNMP and GOSIP are interrelated and will cross-reference each other as required.

00,249
PB93-111656 PC A03/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Statistical Engineering Div.
PC-OMNITAB: An Interactive System for Statistical and Numerical Data Analysis (Documentation).
S. T. Peavy, and R. N. Varner. Oct 92, 11p, NISTIR-4957, NIST/SW/DK-93/001A.
For system on diskette, see PB93-500437.

Keywords: *Statistical analysis, *Numerical analysis, *Data analysis, Arrays, Matrices(Mathematics), Bessel functions, Interactive systems, Least squares method, Personal computers, Plotting, Regression analysis, Thermodynamic properties, Documentation.

PC-OMNITAB, an interactive system for statistical and numerical data analysis, is an extension of OMNITAB 80. The system can be implemented on a 386/486 personal computer which has a math coprocessor and at least 4 MBytes of RAM. PC-OMNITAB responds to simple instructions to obtain accurate results since reliable, varied and sophisticated algorithms for data analysis and manipulation are referenced.

00,250
PB93-138972 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
Using Self-Organizing Recognition as a Mechanism for Rejecting Segmentation Errors.
R. A. Wilkinson, C. L. Wilson, and M. D. Garris. Oct 92, 16p, NISTIR-4938.

Keywords: *Character recognition, *Neural nets, *Text processing, Concurrent processing, Machine learning, Algorithms, Error detection codes, Feature extraction, Classifying, *Segmentation.

The authors have developed a self-organized neural network based method that concurrently detects segmentation errors and performs character recognition. This method utilizes a two-pass classification scheme. A page of machine printed text is segmented, and a pre-trained self-organizing classifier is used to recognize the images produced by the segmenter. Images that are recognized with a sufficiently high confidence are used to retrain the classifier, adapting the neural network to the current font type being segmented. All the segmented images are then reclassified by the adapted network. The assigned classes of those images which are confidently recognized are accepted, whereas the images which are not confidently recognized are rejected.

00,251
PB93-151215 Not available NTIS
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Factory Automation Systems Div.
Automating Interactive Applications in a Network Environment.
Final rept.
D. Libes. 1992, 6p.
Pub. in International Communications Association Annual Conference and Exhibition-Call for Innovation: Jnl. of Proceedings, Atlanta, GA., May 17-21, 1992, p54-59.

Keywords: *Computer networks, *Interactive systems, *Software tools, Applications programs(Computers), Automation, Computer program verification, Computer communications, Reprints, *Expect computer program.

Expect is a software tool designed to control interactive programs. Expect reads a script that resembles the dialogue itself, but which may include multiple paths through it. Expect can run any program locally or remotely in order to automate a task. Expect successfully deals with interactive programs and is particularly useful in a networked environment in which dissimilar machines must communicate. Expect solves the problem of 'stick the password in the script' as well as several other long-standing problems with traditional workarounds in these areas. Expect also provides the needed support for regression testing, network and computer load generation, and conformance testing in a networked environment. In practice, Expect has entirely relieved numerous computer scientists and network managers of tasks that previously had to be performed by hand. The investment in writing Expect scripts is a minimal one-time cost. Expect itself is free and in the public domain. Expect is in use in over 1000 companies as well as virtually every university in the U.S. and many overseas.

00,252
PB93-153476 Not available NTIS
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Applied and Computational Mathematics Div.
Robust Parallel Computation in Floating-Point and SLI Arithmetic.
Final rept.
D. W. Lozier, and P. R. Turner. 1992, 19p.
Pub. in Computing 48, p239-257 1992.

Keywords: *Floating point arithmetic, *Computation, *Parallel processing, Vector processing, Algorithms, Accuracy, Reprints, SLI((Symmetric Level-Index) arithmetic).

The paper considers the parallel computation of vector norms and inner products in floating-point and a proposed new form of computer arithmetic, the symmetric level-index system. The vector norms provide an illuminating example of the contrast between the two arithmetic systems under discussion in terms of the ability to program for (complete) robustness and parallelizability. The conflict between robustness of the computation -- in the sense of the dual requirements of accuracy and freedom from overflow and underflow -- and easy parallelization of the algorithms within a floating-point environment is made plain. It is seen that this conflict disappears if the symmetric level-index system of arithmetic is used. The freedom from overflow and underflow offered by this system allows the programming of the straightforward definitions in a way which is simple, robust and immediately parallelizable. Numerical results are given to illustrate the fact that the symmetric level-index system yields results of comparable accuracy to those of floating-point in cases where the latter system works and still yields results of high accuracy when the floating-point system fails altogether.

00,253
PB93-161339 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
Synthetic-Perturbation Tuning of MIMD Programs.
G. Lyon, R. Snelick, and R. Kacker. Feb 93, 30p, NISTIR-5131.
See also PB91-222588. Sponsored by Defense Advanced Research Projects Agency, Arlington, VA.

Keywords: *Parallel programming, Performance evaluation, Response time(Computers), Concurrent processing, Distributed computer systems, *SPT(Synthetic-perturbation tuning), *MIMD(Multiple-instruction Multiple-data), DEX(Designed experiments).

Synthetic-perturbation tuning (SPT) is a novel technique for assaying and improving the performance of programs on Multiple-instruction Multiple-data (MIMD) systems. Conceptually, SPT brings the powerful, mathematical perspective of statistically designed experiments (DEX) to the interdependent, sometimes refractory aspects of MIMD program tuning. Practically, SPT provides a needed reconfiguration mechanism via synthetic delays for what otherwise would be ad hoc, hand-tailored program setups for DEX. Overall, the technique identifies bottlenecks in programs directly as quantitative effects upon response time. SPT works on programs for both shared and distributed-memory and its scales well with increasing system size.

00,254
PB93-163178 PC A14/MF A03
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
COBOL Compiler Validation System (CCVS 85), User Guide, Version 4.2.
User guide.
25 May 93, 312p, NIST/SW/MT-93/003A.
For system on magnetic tape, see PB93-504918. Prepared in cooperation with National Computing Centre Ltd., Manchester (England).

Keywords: *Compilers, *Standards, *Computer program verification, Federal information processing standards, Tests, Debugging(Computers), User manuals(Computer programs), Documentation, *Cobol programming language, ISO(International Organization for Standardization).

The report is a comprehensive user guide for the COBOL 85 Compiler Validation System. It gives a brief description of each test program and supplies information on running the tests and interpreting the results. The validation system is used to validate COBOL compilers to ensure their conformance to the Federal standard as prescribed in Federal Information Processing Standards (FIPS) PUB 21-3 and the International Organization for Standardization (ISO) Standard 1989:1985. It consists of approximately 300 COBOL programs, each of which contains several independent tests.

00,255
PB93-178556 PC A07/MF A02
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
International Survey of Industrial Applications of Formal Methods. Volume 1. Purpose, Approach, Analysis, and Conclusions.
D. Craigen, S. Gerhart, T. Ralston, and K. Summerskill. Mar 93, 128p, NIST/GCR-93/626-VOL-1.
See also Volume 2, PB93-178564. Sponsored by Atomic Energy Control Board, Ottawa (Ontario), and Naval Research Lab., Washington, DC.

Keywords: *Software engineering, *Applications programs(Computers), *Industries, Systems engineering, Standards, Case studies, Research and development, Methodology, Systems analysis, Surveys, *Formal methods.

Formal methods are mathematically-based techniques, often supported by reasoning tools, that can offer a rigorous and effective way to model, design and analyze computer systems. The purpose of the study is to evaluate international industrial experience in using formal methods. The cases selected are representative of industrial-grade projects and span a variety of application domains. The study had three main objectives: to better inform deliberations within industry and government on standards and regulations; to provide an authoritative record on the practical experience of formal methods to date; and to suggest areas where future research and technology development are needed. The volume is the first of a two volume, final report on an international survey of industrial applications of formal methods. It describes the study, the formal methods, the cases that were studied, the approach to performing the study, and the analysis, findings and conclusions.

00,256
PB93-178564 PC A09/MF A03
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
International Survey of Industrial Applications of Formal Methods. Volume 2. Case Studies.
D. Craigen, S. Gerhart, T. Ralston, and K. Summerskill. Mar 93, 200p, NIST/GCR-93/626-VOL-2.
See also Volume 1, PB93-178556. Sponsored by Atomic Energy Control Board, Ottawa (Ontario), and Naval Research Lab., Washington, DC.

Keywords: *Software engineering, *Applications programs(Computers), *Industries, Case studies, Research and development, Systems analysis, Surveys, *Formal methods.

Formal methods are mathematically-based techniques, often supported by reasoning tools, that can offer a rigorous and effective way to model, design and analyze computer systems. The purpose of the study is to evaluate international industrial experience in using formal methods. The cases selected are representative of industrial-grade projects and span a variety of application domains. The study had three main objectives: to better inform deliberations within industry and government on standards and regulations; to provide an authoritative record on the practical experience of formal methods to date; and to suggest areas where future research and technology development are needed. The volume is the second of a two volume, final report on an international survey of industrial applications of formal methods. It provides the details of the twelve case studies. For each of the case studies, it presents a case description, summarizes the informa-

tion obtained (from interviews and the literature), provides an evaluation of the case, highlights R & D issues pertaining to formal methods and provides some conclusions.

00,257
PB93-178572 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Using Synthetic-Perturbation Techniques for Tuning Shared Memory Programs.
R. Snelick, J. Ja'Ja', R. Kacker, and G. Lyon. Mar 93, 35p, NISTIR-5139.
See also PB93-161339. Prepared in cooperation with Maryland Univ., College Park. Sponsored by Defense Advanced Research Projects Agency, Arlington, VA.

Keywords: *Software engineering, Computer software, Memory(Computers), Multiprocessors, Computer program portability, Computer programming, Case studies, Image processing, Sorting routines, Parallel processing, *MIMD(Multiple-instruction multiple-data), *SPT(Synthetic Perturbation Tuning).

The Synthetic Perturbation Tuning (SPT) methodology is based on an empirical approach that introduces artificial delays into the multiple-instruction stream, multiple-data stream (MIMD) program and captures the effects of such delays by using the modern branch of statistics called design of experiments. SPT provides the basis of a powerful tool for tuning MIMD programs that are portable across machines and architectures. The purpose of the paper is to explain the general approach and to extend it to address specific features that are the main source of poor performance on the shared memory programming model. These include performance degradation due to load imbalance and insufficient parallelism, overhead introduced by synchronizations and by accessing shared data structures, and compute time bottlenecks. The authors illustrate its use on two very different case studies: a large image processing benchmark and a parallel quicksort.

00,258
PB93-182053 PC A08/MF A02
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Manual for Data Administration.
Special pub.
J. J. Newton, and D. C. Wahl. Mar 93, 160p, NIST/SP-500/208.
Also available from Supt. of Docs as SN003-003-03208-5. See also PB90-147919. Prepared in cooperation with Vector Research, Inc., Arlington, VA. Sponsored by Data Administration Management Association, Washington, DC. National Capital Region.

Keywords: *Data management, Standardization, Information management, Standards, Computer software, Software tools, Data dictionaries, Data structures, Data processing security, Information systems, *Data administration.

Data Administration is emerging as an independent discipline. Its fundamental objectives are to maximize the value, quality and usability of data resources. Data Administrators address Data Standardization, Automated Tools, Data Security, Repository Management and Strategic Data Planning. The manual is the result of two years' efforts by the National Capital Region Data Administration Management Association (NCR-DAMA) Standards and Procedures Working Group. It includes an extensive bibliography.

00,259
PB93-183465 PC A03/MF A01
National Inst. of Standards and Technology (NCSL), Gaithersburg, MD. Systems and Network Architecture Div.
Distributed Implementation Generator: An Overview and User Guide.
Draft technical rept.
R. Sijelmassi, and B. Strausser. Jan 91, 45p, NCSL/SNA-91/3, NIST/SW/MT-93/005B.
For system on magnetic tape, see PB93-505758.

Keywords: C++ programming language, Software tools, Documentation, *Distributed Implementation Generator, DINGO(Distributed ImplementatioN GeneratOr), ESTELLE technique.

The Distributed ImplementatioN GeneratOr (DINGO) generates C++ code for distributed, prototype implementations of systems described in the International Standard Formal Description Technique, Estelle. The input to DINGO is in the form of objects generated by the Portable Estelle Translator (PET) developed at the National Institute of Standards and Technology. DINGO generates code that implements all Estelle. The generated C++ must be compiled using a C++ compiler and then linked with runtime libraries to produce a set of executable programs to be run as a set of operating system processes on one or more interconnected machines. The distribution of modules over operating system processes and over sites of a distributed system is controlled by the user. Elements of an X-Window interface may also be generated by DINGO, so that individual modules can be monitored by the user. The user may also manipulate the generated code and/or provide primitives to extend the resulting prototype implementations or to interface with other applications. The document is an overview of the system and a user guide.

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PB93-183473 PC A03/MF A01
National Inst. of Standards and Technology (NCSL), Gaithersburg, MD. Systems and Network Architecture Div.
Portable Estelle Translator: An Overview and User Guide.
Technical rept.
R. Sijelmassi, and B. Strausser. Jan 91, 15p, NCSL/SNA-91/2, NIST/SW/MT-93/005A.
For system on magnetic tape, see PB93-505758.

Keywords: *Translators, Object-oriented programming, C++ programming language, Software tools, Error analysis, Semantics, Syntax, Documentation, *Estelle translator.

The Portable Estelle Translator (PET) was designed to provide support for a wide variety of tools for Estelle. The translator is built around an Object-Oriented model of Estelle, which allows the representation of Estelle specifications as a collection of objects. The PET checks Estelle specifications for syntax and semantic errors and generates a collection of Estelle objects. These objects can then be exploited by a variety of applications ranging from pretty printing to generation of distributed code that implements the specification. The translator has three major components: the lexical analyzer, the parser, and the collection of classes describing the structure and behavior of objects generated by the translator; all three are implemented in C++. The document gives an overview of the structure and operation of these components and provides information on using the PET as a front end for any tool that processes Estelle specifications.

00,261
PB93-189835 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Building Hadamard Matrices in Steps of 4 to Order 200.
N. Drouin. Apr 93, 22p, NISTIR-5121.

Keywords: Computer program verification, Systems analysis, Sensitivity, Experimental design, *SPT(Synthetic Perturbation Tuning), *Hadamard matrices, Fractional factorial design.

Based on methods of construction described in 1978, the programs described allow one to build Hadamard matrices of order up to 200, in steps of 4. These matrices are to be used to generate statistical plans of analysis for the 'Synthetic Perturbation Tuning' technique of program sensitivity analysis.

00,262
PB93-191641 PC A22/MF A04
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
First Text REtrieval Conference (TREC-1).
Special pub.
D. K. Harman. Mar 93, 517p, NIST/SP-500/207.
Also available from Supt. of Docs. as SN003-003-03207-7.

Keywords: *Meetings, *Information retrieval, *Text processing, Algorithms, Automatic Indexing, Documents, Routing, Data bases, Natural language processing, On-line systems, Search structuring, Machine learning, Pattern recognition, Query processing.

The first Text REtrieval Conference (TREC-1) was held in early November 1992 and was attended by about 100 people involved in the 25 participating groups. The goal of the conference was to bring research groups together to discuss their work on a new large test collection. There was a large variation of retrieval techniques reported on, including methods using automatic thesauri sophisticated term weighting, natural language techniques, relevance feedback, and advanced pattern matching. As results had been run through a common evaluation package, groups were able to compare the effectiveness of different techniques, and discuss how differences among the systems affected performance.

00,263
PB93-200871 PC A06/MF A02
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Systems and Software Technology Div.
Software Error Analysis.
Special pub.
W. W. Peng, and D. R. Wallace. Apr 93, 113p, NIST/SP-500/209.
Also available from Supt. of Docs as SN003-003-03212-3.

Keywords: *Computer program integrity, *Error analysis, Error detection codes, Software engineering, Computer program verification, Tests, Computer program reliability, Models, Quality assurance, Data acquisition.

The document provides guidance on software error analysis. Software error analysis includes error detection, analysis, and resolution. Error detection techniques considered in the study are those used in software development, software quality assurance, and software verification, validation and testing activities. These techniques are those frequently cited in technical literature and software engineering standards or those representing new approaches to support error detection. The study includes statistical process control techniques and relates them to their use as a software quality assurance technique for both product and process improvement. Finally, the report describes several software reliability models.

00,264
PB93-216943 PC A06/MF A02
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Systems and Software Technology Div.
Application Portability Profile (APP): The U.S. Government's Open System Environment Profile OSE/1 Version 2.0.
Special pub.
G. E. Fisher. Jun 93, 106p, NIST/SP-500-210.
Supersedes PB91-201004. Also available from Supt. of Docs. as SN003-003-03222-1.

Keywords: *Computer program portability, Computer program transferability, Federal information processing standards, National Government, Computer networks, Software engineering, Computer applications, Specifications, Recommendations, *Open System Environment, *Application Portability Profile, APP(Application Portability Profile), Federal agencies.

An Open System Environment (OSE) encompasses the functionality needed to provide Interoperability, portability, and scalability of computerized applications across networks of heterogeneous hardware/software platforms. The OSE forms an extensible framework that allows interfaces, services, protocols, and supporting data formats to be defined in terms of nonproprietary specifications that evolve through open (public), consensus-based forums. A selected suite of specifications that define these interfaces, services, protocols, and data formats for a particular class or domain of applications is called a profile. The Application Portability Profile (APP) is the U.S. Government's OSE profile. It was developed to provide functionality across a broad range of Federal applications. The report describes the service areas and components included in the APP and provides evaluations of recommended specifications for the majority of the service area components. Organizations should use the report to assist in determining which specifications may be applicable to their particular environments.

00,265
PB93-220838 PC A02/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
NIST EXPRESS Toolkit: Requirements for Improvements. National PDES Testbed Report Series.
D. Libes, and J. Fowler. 26 Jun 93, 10p, NISTIR-5212.
See also PB92-181205, PB92-187038, PB93-153450 and PB93-220846. Sponsored by CALS Evaluation and Integration Office, Washington, DC.

Keywords: *Software tools, Computer aided manufacturing, Computer aided design, Standards, Compilers, PDES(Product Data Exchange Using STEP), STEP(Standard for the Exchange of Product Model Data), EXPRESS programming language, Software libraries, US NIST.

The NIST EXPRESS toolkit is a software library for building software tools for manipulating information models written in the EXPRESS language. The paper is one in a series describing the latest version of the toolkit. The document describes shortcomings of previous versions of the toolkit, requirements for improvement, and a recommended approach for addressing those requirements. A background knowledge of EXPRESS and the EXPRESS toolkit is presumed as well as a rudimentary grasp of basic compiler construction techniques.

00,266
PB93-220846 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
NIST EXPRESS Toolkit: Updating Existing Applications. National PDES Testbed Report Series.
D. Libes. 15 Jun 93, 16p, NISTIR-5205.
See also PB93-220853. Sponsored by CALS Evaluation and Integration Office, Washington, DC.

Keywords: *Software tools, Computer aided design, Computer aided manufacturing, Standards, Compilers, PDES(Product Data Exchange Using STEP), STEP(Standard for the Exchange of Product Model Data), EXPRESS programming language, Software libraries, US NIST.

The PDES (Product Data Exchange using STEP) activity is the United States' effort in support of the Standard for the Exchange of Product Model Data (STEP), an emerging international standard for the interchange of product data between various vendors' CAD/CAM systems and other manufacturing-related software. A National PDES Testbed has been established at the National Institute of Standards and Technology to provide testing and validation facilities for the emerging standard. As part of the testing effort, NIST is charged with providing a software toolkit for manipulating STEP data. The NIST EXPRESS toolkit is a software library for building EXPRESS-related tools. The toolkit was previously released in 1991, based on ISO TC184/SC4 N14 (familiarly called 'EXPRESS N14'). The current release is based on Draft International Standard (DIS) 10303-11 (N151) and while the philosophical underpinnings are similar, much of the interface has changed significantly. The paper describes changes that must be made to existing applications so that they can work with the new toolkit.

00,267
PB93-220853 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
NIST EXPRESS Toolkit: Using Applications. National PDES Testbed Report Series.
D. Libes. 15 Jun 93, 21p, NISTIR-5206.
See also PB93-220838. Sponsored by CALS Evaluation and Integration Office, Washington, DC.

Keywords: *Software tools, Computer aided design, Computer aided manufacturing, Compilers, Standards, PDES(Product Data Exchange Using STEP), STEP(Standard for the Exchange of Product Model Data), EXPRESS programming language, Software libraries, US NIST.

The PDES (Product Data Exchange using STEP) activity is the United States' effort in support of the Standard for the Exchange of Product Model Data (STEP), an emerging international standard for the interchange of product data between vendors' CAD/CAM systems and other manufacturing-related software. A National PDES Testbed has been established at the National Institute of Standards and Technology to provide testing and validation facilities for the emerging standard. As part of the testing effort, NIST is charged with providing a software toolkit for manipulating STEP data. The NIST EXPRESS Toolkit is a software library for building EXPRESS-related tools. The NIST Part 21 Exchange File Toolkit is a software library for building Part 21-related tools. The paper describes how to use applications built with the toolkits. This includes typical applications such as 'fedex' and 'p21', which are standalone programs that read and report errors in EXPRESS schemas and Part 21 exchange files. Readers of the document need no knowledge of the internals of the toolkits.

00,268
PB93-228617 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
User's Guide for the Programmer's Hierarchical Interactive Graphics System (PHIGS) C Binding Validation Tests (Version 2).
K. Brady, and J. Cugini. Aug 93, 30p, NISTIR-5238.
See also PB93-126365.

Keywords: *Computer graphics, *Standards, *Computer program verification, Tests, Interactive graphics, Subroutine libraries, Debugging(Computers), UNIX(Operating system), *PHIGS(Programmers Hierarchical Interactive Graphics System), C programming language, NIST(National Institute of Standards and Technology), Conformance testing.

The Programmer's Hierarchical Interactive Graphics System (PHIGS) Validation Tests (PVT), developed by the National Institute of Standards and Technology (NIST), consist of a large set of 'C' programs which may be used to test how well an implementation of PHIGS conforms to the 'C' binding. The tests are organized into a hierarchical structure of modules which corresponds to the conceptual overview of the standard. Directions for installation and operation of the tests are included.

00,269
PB93-500437 CP D03
National Inst. of Standards and Technology, Gaithersburg, MD.
PC-OMNITAB: An Interactive System for Statistical and Numerical Data Analysis, Version 7.0 (for Microcomputers).
Model-Simulation.
Oct 92, diskette, NIST/SW/DK-93/001.
System: 386/486 PC with Math Coprocessor; DOS 3.30 or higher operating system, 4MB. Language: Executable/Fortran. Check with README file before installing. Then use INSTALL file to load PC-OMNITAB on the PC. Requires the OTG DBOS and OTG FTN runtime library. Contact OTG Systems, Inc. (717-222-9100) for above software. See also PB91-507962, PB91-507954, PB91-505511 and PB87-172235.
The software is on one 3 1/2 inch diskette, 1.44M high density. Documentation included; may be ordered separately as PB93-111656.

Keywords: *Models-Simulation, *Software, *Statistical analysis, *Numerical analysis, *Data analysis, Arrays, Matrices(Mathematics), Bessel functions, Interactive systems, Least squares method, Personal computers, Plotting, Regression analysis, Thermodynamic properties, Diskettes.

PC-OMNITAB, an interactive system for statistical and numerical data analysis, is an extension of OMNITAB 80. It permits one to perform arithmetic, complex arithmetric, trigometric calculations as well as data manipulation, special function calculations, statistical analysis, matrix and array operations. Some of the major statistical capabilities are regression, correlation analysis and oneway/twoway analysis. The system can be implemented on a 386/486 personal computer which has a math coprocessor and at least 4 MBytes of RAM. PC-OMNITAB responds to simple instructions to obtain accurate results since reliable, varied and sophisticated algorithms for data analysis and manipulation are referenced.

00,270
PB93-504918 CP T99
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
COBOL 85 Compiler Validation System (CCVS 85), Version 4.2.
Software.
Mar 93, mag tape, NIST/SW/MT-93/004.
System: IBM 4341; VM/CMS Release 3 operating system. Language: COBOL. No Sales to Japan or Europe. Supersedes PB91-508002.
Available in 9-track, ASCII character set tape, 1600 bpi, 6250 bpi, or 3480 cartridge. Documentation included; may be ordered separately as PB93-163178.

Keywords: *Software, *Compilers, *Standards, *Computer program verification, Federal information processing standards, Tests, Debugging(Computers), Magnetic tapes, *Cobol programming language, ISO (International Organization for Standardization).

The COBOL 85 Compiler Validation System is used to validate COBOL compilers to ensure their conformance to the Federal Standard as prescribed in Federal Information Processing Standards (FIPS) PUB 21-3 and the International Organization for Standardization (ISO) Standard 1989:1985. The validation system consists of approximately 300 COBOL programs, each of which contains several independent tests. In addition, there is a routine which enables users of the text suite to separate programs by module, level or program name, and automatically replace implementor defined features. The test programs are organized by module as defined in the COBOL 1985 Standard and Intrinsic Function Module addendum, i.e., NUCLEUS, SEQUENTIAL I-O, RELATIVE I-O, INDEXED I-O, Inter-Program Communication, Sort-Merge, Source Text Manipulation, Intrinsic Functions and the optional modules Report Writer, Communications, Debug and Segmentation. The tests are further organized according to one of two levels defined in the COBOL 1985 Standard.

00,271
PB93-505758 Mag Tape $2400.00
National Inst. of Standards and Technology, Gaithersburg, MD.
OSIKIT (Open Systems Interconnection) and NIST Prototype Compiler for Estelle.
Software.
cAug 91, mag tape, NIST/SW/MT-93/005.
System: Unix operating system. Language: TAR. Supersedes PB92-501428. See also PB86-146537, and PB86-118700. Typical Unix commands for loading the tape; mkdir osikit, cd osikit, tar xf/dev/rst0.
Available in 9-track tape, 1600 bpi, or 6250 bpi. Documentation included; may be ordered separately as PB93-183473, PB93-183465, PB89-196190, PB89-196182, PB89-196174, PB89-196166, PB89-196158 and PB88-124193.

Keywords: *Software, C++ programming language, C programming language, Software tools, Magnetic tapes, Compilers, Open systems interconnections, Unix operating system, Estelle technique, ASN.1.

OSIKIT is a collection of tools for application of Estelle and ASN.1 that were developed by the National Institute of Standards and Technology (NIST). The Estelle Prototype Compiler is a compiler from Estelle to the C language, along with a runtime system written in C. The Free Value Tool for ASN.1 is suitable for evaluating modules in ASN.1 or for building a prototype encoder-decoder. The Estelle Syntax-directed Editor, called Wizard, includes syntax-directed editing of Estelle, through checking of syntax and static semantics, and code generation for the Wise tool. The Estelle simulation environment, called Wise, provides window-based simulation and symbolic debugging for specifications written in Estelle. Some of the tools require support software. They were developed in a Unix environment. The Portable Estelle Translator (PET) provides syntax and static semantics checking of Estelle and a representation of the specification in the defined model form. The Distributed Implementation Generator (DINGO) uses the model representation produced by PET as input to generate a prototype implementation of the specification in the language C++. Included libraries permit execution of the implementation with a window environment for symbolic debugging of the specification.

00,272
PB93-937300 Contact NTIS for subscription information and price.
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Validated Products List (Cobol, Fortran, ADA, Pascal, C, MUMPS, SQL, Graphics, GOSIP, POSIX, Computer Security).
Quarterly rept.
1993, 1p.
Supersedes PB92-937300.
Paper copy available on Standing Order, deposit account required (U.S., Canada, and Mexico $100; all others $200). Single copies also available in paper copy only.

Keywords: *Cobol programming language, *Fortran programming language, Language programming, *Federal Information Processing Standards, *Validation summary reports, *Pascal programming language, *Ada programming language, *C programming language, *Computer graphics(GKS-CGM-PHIGS-Raster), *GOSIP, *POSIX, *Computer security(DES-MAC-Key Management), SQL programming language.

The Validated Products List (VPL) identifies information technology products that have been tested for con-

formance to Federal Information Processing Standards (FIPS) in accordance with Computer systems Laboratory (CSL) conformance testing procedures, and have a current validation certificate or registered test report. The VPL includes computer language processors for programming languages Ada, C, COBOL, Fortran, MUMPS, Pascal, and database language SQL; computer graphic implementations for GKS, CGM, PHIGS, and Raster Graphics; operating system implementations for POSIX; open systems interconnect implementations for GOSIP; and computer security implementations for DES, MAC and Key Management. The testing of products to assure conformance to the FIPS may be required by Government agencies in accordance with the FIPS, Federal Information Resources Management Regulation (FIRMR) Parts 201/13 and 201/39, and the associated Federal ADP and Telecommunications Standards Index. The VPL is updated and published quarterly.

00,273
PB94-104585 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Security Issues in the Database Language SQL.
Special pub.
W. T. Polk, and L. E. Bassham. Aug 93, 49p, NIST/SP-800-8.
Also available from Supt. of Docs. as SN003-003-03225-5.

Keywords: *Data processing security, *Data base management systems, Computer security, Relational data bases, Access control, Data integrity, Standards, Authentication, Tests, Computer program reliability, Fault tolerant computing, *SQL data base language.

The document examines the specific functionality that might be required of relational database management systems (DBMS's), and compares them with the requirements and options of the SQL specifications. The comparison shows that the security functionality of an SQL-compliant DBMS may vary greatly. A variety of security policies are considered which can be supported by SQL. The document ends by showing which types of functions are required by the examined security policies.

00,274
PB94-112497 PC A07/MF A02
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Systems and Software Technology Div.
Reference Model for Frameworks of Software Engineering Environments (Technical Report ECMA TR/55, 3rd Edition).
Special pub.
Aug 93, 128p, NIST/SP-500-211.
Supersedes PB92-158328. Also available from Supt. of Docs. as SN003-003-03227-1. Prepared in cooperation with European Computer Manufacturers Association.

Keywords: *Software engineering, *Models, Software tools, Computer systems hardware, Operating systems(Computers), Computer program portability, Services, Data management, Computer communications, Man computer interface, Access control, *SEEs(Software Engineering Environments), *Frameworks.

Software engineering environments (SEEs) are typically built on hardware and operating system platforms. Current SEE architectures distinguish between the set of facilities in support of the life cycle project, usually denoted 'tools', and a set of relatively fixed infrastructure capabilities which provide support for processes, objects, or user interfaces, denoted 'frameworks'. A major purpose of frameworks is to simplify the construction of tools by providing a set of commonly needed facilities, key integration components, and support for higher level constructs than those found in typical operating systems. Another purpose may be to support the porting of environments across a variety of hardware configurations and native operating systems. Tools may also use services provided by other tools, and framework components may use services from other framework components. The report describes a reference model supporting these framework services.

00,275
PB94-118460 PC A08/MF A02
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Software Standards Validation Group.
FORTRAN Compiler Validation System 1978. User's Guide, Version 2.1.
1 Aug 93, 155p, NISTIR-5287.
See also AD-A062 037 and magnetic tape AD-A062 036.

Keywords: *Compilers, *Tests, Federal information processing standards, Computer program verification, Computer software management, Specifications, File structures, User manuals(Computer programs), *Fortran programming language, Conformance testing, FEXEC.

The guide gives information and procedures to install and implement the Fortran Compiler Validation System (FCVS) for testing conformance to Federal Information Processing Standards (FIPS) PUB 69 in accordance with Computer Systems Laboratory (CSL) conformance testing procedures.

00,276
PB94-120797 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Factory Automation Systems Div.
Exppp: An EXPRESS Pretty Printer. National PDES Testbed Report Series.
D. Libes. 8 Nov 93, 18p, NISTIR-5292.
See also PB93-178655, PB93-220838, and PB93-220853. Sponsored by CALS Evaluation and Integration Office, Washington, DC.

Keywords: *Programming languages, *Programming manuals, *Regulations, *Printers(Data processing), Tools, User manuals(Computer programs), Man machine systems, Computer codes, Writing, Computer programming, Computer programs, Improvement, Sorting routines, Standards, Procedure oriented languages, Test beds, *EXPRESS, *Pretty print, *STEP(Standard for the Exchange of Product Model Data), PDES(Product Data Exchange using STEP).

EXPRESS is a data modeling language. EXPRESS is relatively new having only been standardized in 1993. Today, few tools exist that automatically generate EXPRESS and correspondingly most EXPRESS is handwritten. In the future, the authors predict that all but a tiny fraction of EXPRESS will be computer generated or computer read. While perhaps only during debugging, much of it will be read by humans so it is important that it 'appear' as easy to read as possible.

Control Systems & Control Theory

00,277
PB93-151595 Not available NTIS
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Factory Automation Systems Div.
Collective Learning Systems: A Model for Automatic Control.
Final rept.
S. A. Osella. 1989, 6p.
Pub. in Proceedings of IEEE (Institute of Electrical and Electronics Engineers) International Symposium (4th) on Intelligent Control, Albany, NY., September 25-26, 1989, Cat. No. 89TH0282-4, p393-398.

Keywords: *Adaptive control, *Artificial Intelligence, Automatic control, Knowledge bases(Artificial intelligence), Data acquisition, Machine learning, Data structures, Object-oriented programming, Self adaptive control systems, Reprints.

Adaptive control is usually required in situations where conditions are widely varying and/or unpredictable. Adaptive controllers have been implemented using Artificial Intelligence (AI) techniques. Knowledge acquisition, in the classical AI approach, consists of programming a knowledge-base encoded in the form of rules, frames, or object-oriented data structures. However, except for the most trivial of problems, the time and resources required to accumulate enough knowledge is intractably high. Collective Learning Systems (CLS) is a paradigm for the acquisition and application of knowledge through learning. In the CLS approach, Collective Learning Automata acquire knowledge through a learning process consisting of trial-and-error interactions with the environment. The paper investigates how CLS theory may be used to model and implement adaptive control systems. The pole-balancing problem is posed as the experimental system paradigm.

Information Processing Standards

00,278
AD-A265 261/8 PC A04/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Ada Compiler Validation Summary Report. Certificate Number: 920918S1.11271, U.S. Navy AdaVAX Version 5.5 (/NO OPTIMIZE) VAXstation 4000 > VAXstation 4000.
Final rept.
18 Sep 92, 73p, NIST92USN500-2-1.11.

Keywords: *Ada programming language, *Compilers, Standards, Operating systems(Computers), Computer program verification, Naval research, *Validation summary reports, ADAVAX Version 5.5, Macro parameters, VAX Operating systems, VAXstation 4000 computers.

U.S. NAVY, AdaVAX, Version 5.5 (/NO OPTIMIZE), VAXstation 4000, (running VAX/VMS Version 5.5) (host and target), ACVC 1.11.

00,279
FIPS PUB 125-1 PC E99
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
MUMPS, Massachusetts General Hospital Utility Multi-Programming System. Category: Software Standard. Subcategory: Programming Language, June 1993.
Final rept.
W. H. Dashiell. 10 Jun 93, 161p.
Supersedes FIPS PUB 125.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Programming languages, *Information systems, *Computer programming, Data management, Computer systems programs, Syntax, Semantics, Data systems, MUMPS programming language, Federal Information Processing Standards, Metalanguage.

The publication announces the adoption of American National Standard for MUMPS, ANSI/MDC X11.1-1990, as a Federal Information Processing Standard (FIPS). The standard supersedes FIPS PUB 125 in its entirety. The American National Standard for MUMPS specifies the form and establishes the interpretation of programs written in the MUMPS programming language. The purpose of the standard is to promote portability of MUMPS programs for use on a variety of data processing systems. The standard is for use by implementors as the reference authority in developing compilers, interpreters, or other forms of high level language processors; and by other computer professionals who need to know the precise syntactic and semantic rules adopted by ANSI.

00,280
FIPS PUB 127-2 PC E99
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Database Language SQL. Category: Software Standard. Subcategory: Database, June 1993.
Final rept.
2 Jun 93, 652p.
Supersedes FIPS PUB 127-1.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Query languages, *Information retrieval, *Language programming, Data processing, Data bases, Information transfer, Information flow, Computer systems programs, Data base management systems, Information management, *SQL database language, *Structured Query Language, Federal Information Processing Standards.

The publication announces adoption of American National Standard Database Language SQL, ANSI X3.135-1992, as the Federal Information Processing Standard for Database Language SQL (FIPS SQL). It is a revision of FIPS PUB 127-1 that adds extensive new functionality to the SQL language. Conformance to FIPS SQL is mandatory for all Federal procurements of relational model database management systems. FIPS SQL is specified to have four conformance levels: Entry SQL, Transitional SQL, Intermediate SQL, and Full SQL. Although only Entry SQL is required for conformance to FIPS SQL, the other conformance levels may be specified as mandatory requirements in individual procurements. FIPS SQL also provides default sizing parameters and limits for SQL constructs to pro-

vide a common baseline for database interoperability. The purpose of FIPS SQL is to promote portability and interoperability of database application programs, to facilitate maintenance of database systems among heterogeneous data processing environments, and to allow for the efficient exchange of programmers among different data management projects.

00,281
FIPS PUB 128-1A PC E99
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Computer Graphics Metafile (CGM). Category: Software Standard. Subcategory: Graphics. Part 1. Functional Specification.
Final rept.
D. R. Benigni. 11 May 93, 354p.
Supersedes FIPS PUB 128. See also FIPS PUB 128-1E.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Data processing, Computer systems programs, Software engineering, Specifications, Digital data, Data transfer, *CGM(Computer Graphics Metafile), Federal Information Processing Standards, Functional specification, CALS(Computer-aided Acquisition and Logistics Support), Graphics data interfaces, Picture transfer, Continuous Acquisition and Life Cycle Support.

The Computer Graphics Metafile provides a file format suitable for the storage and retrieval of picture information. The file format consists of a set of elements that can be used to describe pictures in a way that is compatible between systems of different architectures and devices of differing capabilities and design. The picture description includes the capability for describing static pictures. Static pictures are those where elements which may lead to dynamic effects (for example those leading to regeneration) are prohibited within the picture body.

00,282
FIPS PUB 128-1B PC E99
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Computer Graphics Metafile (CGM). Category: Software Standard. Subcategory: Graphics. Part 2. Character Encoding.
Final rept.
D. R. Benigni. 11 May 93, 106p.
Supersedes FIPS PUB 128. See also FIPS PUB 128-1A.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Data processing, Computer systems programs, Coding, Data compression, Software engineering, Specifications, Digital data, Syntax, Information transfer, *CGM(Computer Graphics Metafile), Federal Information Processing Standards, Character encoding, Information compaction, CALS(Computer-aided Acquisition and Logistics Support), Graphics data interfaces, Picture transfer, Continuous Acquisition and Life Cycle Support.

The Character Encoding of the Computer Graphics Metafile (CGM) provides a representation of the Metafile syntax intended for situations in which it is important to minimize the size of the metafile or transmit the metafile through character-oriented communications services. The encoding uses compact representation of data that is optimized for storage or transfer between computer systems.

00,283
FIPS PUB 128-1C PC E99
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Computer Graphics Metafile (CGM). Category: Software Standard. Subcategory: Graphics. Part 3. Binary Encoding.
Final rept.
D. R. Benigni. 11 May 93, 87p.
Supersedes FIPS PUB 128. See also FIPS PUB 128-1B.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Data processing, Coding, Binary codes, Binary data, Data compression, Computer systems programs, Software engineering, Specifications, Digital data, Syntax, Signal encoding, Data transfer, *CGM(Computer Graphics Metafile), Federal Information Processing Standards, Binary encoding, CALS(Computer-aided Acquisition and Logistics Support), Graphics data interfaces, Picture transfer, Continuous Acquisition and Life Cycle Support.

The Binary Encoding of the Computer Graphics Metafile (CGM) provides a representation of the Metafile syntax that can be optimized for speed of generation and interpretation, while still providing a standard means of interchange among computer systems. The encoding uses binary data formats that are much more similar to the data representations used within computer systems than the data formats of the other encodings. Some of the data formats may exactly match those of some computer systems. In such cases processing is reduced very much relative to the other standardized encodings. On most computer systems processing requirements for the Binary Encoding will be substantially lower than for the other encodings.

00,284
FIPS PUB 128-1D PC E99
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Computer Graphics Metafile (CGM). Category: Software Standard. Subcategory: Graphics. Part 4. Clear Text Encoding.
Final rept.
D. R. Benigni. 11 May 93, 70p.
Supersedes FIPS PUB 128. See also FIPS PUB 128-1C.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Text processing, Computer systems programs, Software engineering, Specifications, Man-computer interfaces, Text editors, Digital data, Information storage, Syntax, Data transfer, *CGM(Computer Graphics Metafile), Federal Information Processing Standards, Clear text encoding, CALS(Computer-aided Acquisition and Logistics Support), Graphics data interfaces, Picture transfer, Continuous Acquisition and Life Cycle Support.

The Clear Text Encoding of the Computer Graphics Metafile (CGM) provides a representation of the Metafile syntax that is easy to type, edit and read. It allows a metafile to be edited with any standard text editor, using the internal character code of the host computer system.

00,285
FIPS PUB 128-1E PC E99
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Computer Graphics Metafile (CGM). Category: Software Standard. Subcategory: Graphics. Military Specification. Digital Representation for Communication of Illustration Data: CGM Application Profile.
Final rept.
D. R. Benigni. 11 May 93, 61p.
Supersedes FIPS PUB 128. See also FIPS PUB 128-1D.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Data processing, Computer systems programs, Software engineering, Specifications, Digital data, Data transfer, *CGM(Computer Graphics Metafile), Federal Information Processing Standards, Military specifications, CALS(Computer-aided Acquisition and Logistics Support), Graphics data interfaces, Picture transfer, Continuous Acquisition and Life Cycle Support.

The revised FIPS adopts the redesignated version of the CGM standard, known as ANSI/ISO 8632.1-4:1992, and adds a requirement for the use of profiles. A profile defines the options, elements, and parameters of ANSI/ISO 8632 necessary to accomplish a particular function and to maximize the probability of interchange between systems implementing the profile. The revised FIPS also adopts MIL-D-28003A, Computer-Aided Acquisition and Logistics Support (CALS), as the first CGM Application Profile.

00,286
FIPS PUB 172 PC E14
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
VHSIC Hardware Description Language (VHDL); Category: Software Standard; Subcategory: Hardware Description Language. IEEE Standard VHDL Language Reference Manual.
Final rept.
W. H. Dashiell. 29 Jun 92, 211p.
Also pub. as Institute of Electrical and Electronics Engineers, Inc., New York rept. no. IEEE-STD-1076-1987. Prepared in cooperation with Institute of Electrical and Electronics Engineers, Inc., New York.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Computer systems design, *Standards, Computer systems hardware, Specifications, *Federal information processing standards, *Hardware description languages, Very high speed integrated circuits, VHSIC(Circuits), VHDL(VHSIC Hardware Description Language).

The publication announces the adoption of the Federal Information Processing Standard (FIPS) for VHDL. The FIPS adopts American National Standard Hardware Description Language VHDL (ANSI/IEEE 1076-1987) as stipulated in the Specifications Section. The American National Standard specifies the form and establishes the interpretation of programs expressed in VHDL. The purpose of the standard is to promote portability of VHDL programs for use on a variety of data processing systems. The standard is used by implementors as the reference authority in developing compilers, interpreters, analyzers, simulators or other forms of high level language processors, and is used by digital hardware designers, and by other computer professionals who need to know the precise syntactic and semantic rules of the standard and who need to provide specifications for digital hardware descriptions.

00,287
FIPS PUB 173 PC A14
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Spatial Data Transfer Standard (SDTS); Category: Software Standard; Subcategory: Information Interchange.
Final rept.
H. Tom. 28 Aug 92, 302p.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Data transfer(Computers), *Federal information processing standards, Mapping, Data structures, Geographic information systems, Topology, Computer software.

The standard provides specifications (developed through the Department of the Interior) for the organization and structure of digital spatial data transfer, definition of spatial features and attributes, and data transfer encoding. The purpose of the standard is to promote and facilitate the transfer of digital spatial data between dissimilar computer systems.

00,288
FIPS PUB 95-1 PC$20.50
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Codes for the Identification of Federal and Federally Assisted Organizations. Category: Data Standard, Representations and Codes.
4 Jan 93, 57p.
Supersedes FIPS PUB 95, December 23, 1982.

Keywords: *Organizations, *Federal information processing standards, *Codes, Administration, Data, Computers, Standards, Information processing, Federal agencies, Federal budgets, Tables(Data).

The standard provides a four-character identifier for each organization listed. The two leftmost characters form a component data element, called the Treasury Agency Symbol (TAS), which is identical to the two-digit numerical code used in the budgetary process to identify major Federal agencies. Organizations that are related by a common budgetary appropriation usually have the same TAS code. Organizations identified in the Standard include legislative, judicial, and executive branch agencies, as well as those Federal-State, interstate and international organizations that receive budgetary support. The standard is an organizational code set, and does not automatically include all fiscal activities represented in Budget accounts. Government-sponsored enterprises and certain Federally aided organizations are included also. Provision is made for the inclusion of additional categories of organizations.

Information Processing Standards

00,289
N93-27714/3 (Order as N93-27704/4, PC A23/MF A04)
National Inst. of Standards and Technology, Gaithersburg, MD.
Data Management Standards In Computer-Aided Acquisition and Logistic Support (CALS).
D. K. Jefferson. 1990, 29p.
In NASA, Washington, Technology for Space Station Evolution. Volume 2: Data Management System/Environmental Control and Life Support Systems p 197-225.

Keywords: *Data management, *Information systems, *Weapon systems, Computer techniques, Cost reduction, Data flow analysis, Dictionaries, Logistics management, *Standards.

Viewgraphs and discussion on data management standards in computer-aided acquisition and logistic support (CALS) are presented. CALS is intended to reduce cost, increase quality, and improve timeliness of weapon system acquisition and support by greatly improving the flow of technical information. The phase 2 standards, industrial environment, are discussed. The information resource dictionary system (IRDS) is described.

00,290
PB93-139053 PC A04/MF A01
National Inst. of Standards and Technology (NCSL), Gaithersburg, MD. Systems and Network Architecture Div.
Guidelines for the Evaluation of Virtual Terminal Implementations.
Special pub. (Final).
C. A. Edgar. Nov 92, 55p, NIST/SP-500/205.
Also available from Supt. of Docs. as SN003-003-03189-5 Sponsored by Internal Revenue Service, Washington, DC.

Keywords: *Evaluation, Guidelines, Remote terminals, Remote systems, Computer networks, Computer communications, Requirements, Local area networks, *Virtual terminals, *GOSIP(Government Open Systems Interconnection Profile), IGOSS(Industry/Government Open Systems Specification), National Institute of Standards and Technology.

The Government Open Systems Interconnection Profile (GOSIP) mandates that Federal agencies requiring remote terminal access capability procure products conforming to the International Organization for Standardization (ISO) Open Systems Interconnection (OSI) Basic Class Virtual Terminal Service and Protocol. The document advances the goals of the GOSIP by assisting a user in determining which Virtual Terminal (VT) implementation, among several candidates, best meets the functional requirements of that user. The differences in VT implementations for the same terminal type are not so great as to warrant a rating algorithm. Still, there are functional issues to be considered in a VT procurement and these issues are described within the document. The current and future availability of VT products is also discussed.

00,291
PB93-153625 Not available NTIS
National Inst. of Standards and Technology (NCSL), Gaithersburg, MD.
Information Technology Standards: Processes and Strategies.
Final rept.
S. M. Radack. 1989, 7p.
Pub. in Proceedings of Conference: NCGA '89, Philadelphia, PA., April 17-20, 1989, p234-240.

Keywords: *Standards, *Information processing, Federal information processing standards, Government/industry relations, Reprints, NIST(National Institute of Standards and Technology), OSI(Open Systems Interconnection).

Standards play an increasingly important role in the strategies of users to make effective use of their information processing systems. The process for achieving voluntary industry consensus standards is exceedingly complex, sometimes slow, and difficult for users to influence. As a large user of information processing systems, the Federal government has a strong interest in getting these standards developed and implemented in commercial, off-the-shelf products. The government's National Institute of Standards and Technology helps to advance the process by assisting industry in standards development and implementation.

00,292
PB93-166809 PC A99/MF E18
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Stable Implementation Agreements for Open Systems Interconnection Protocols. Version 6, Edition 1, December 1992. Based on the Proceedings of the OSE Implementors' Workshop (OIW).
Special pub.
T. Boland, and B. Gray. Mar 93, 1690p, NIST/SP-500/206.
Supersedes PB92-164508. Also available from Supt. of Docs. as SN903-015-00013-6.

Keywords: *Protocols, Local area networks, Standards, Computer networks, *OSI(Open Systems Interconnection), OSE(Open Systems Environment), National Institute of Standards and Technology, Wide area networks, ISDN(Integrated Services Digital Networks).

The document records current stable implementation agreements of Open Systems Interconnection (OSI) protocols among the organizations participating in the Open Systems Environment Implementors' Workshop (OIW).

00,293
PB93-198273 PC A04/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Computer Graphics Metafile (CGM) Test Requirements Document (Update).
Rept. for Oct 92-Sep 93.
L. S. Rosenthal. Apr 93, 58p, NISTIR-5191.
See also PB90-257759. Sponsored by Assistant Secretary of Defense (Production and Logistics), Washington, DC. Computer-aided Acquisition and Logistic Support Program.

Keywords: *Computer graphics, Tests, Standards, Conformity, Logistics, *CALS(Computer Aided Acquisition and Logistic Support), CGM(Computer Graphics Metafile).

The report was prepared by the National Institute of Standards and Technology/Computer Systems Laboratory (NIST/CSL) in support of the Computer-aided Acquisition and Logistic Support (CALS) initiative. It represents a NIST/CSL FY93 contract deliverable task to implement CALS Conformance Testing Services for CGM (Computer Graphic Metafile). In particular, the report updates the CGM Test Requirements Document, published in 1989.

Pattern Recognition & Image Processing

00,294
PB93-146652 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
OCR Error Rate Versus Rejection Rate for Isolated Handprint Characters.
J. Geist, and R. A. Wilkinson. Dec 92, 16p, NISTIR-4990.

Keywords: *Optical character recognition, *Character recognition, Character recognition devices, Performance evaluation, Performance(Human), Error analysis, Handwriting, Comparison, Meetings, Handprinting.

Over twenty-five organizations participating in the First Census Optical Character Recognition (OCR) Systems Conference submitted confidence data as well as character classification data for the digit test in that Conference. A three parameter function of the rejection rate r is fit to the error rate versus rejection rate data derived from this data, and found to fit it very well over the range from r = 0 to r = 0.15. The probability distribution underlying the model e(r) curve is derived and shown to correspond to an inherently inefficient rejection process. With only a few exceptions that seem to be insignificant, all of the organizations submitting data to the Conference for scoring seem to employ this same rejection process with a remarkable uniformity of efficiency with respect to the maximum efficiency allowed for this process. Two measures of rejection efficiency are derived, and a practical definition of ideal OCR performance in the classification of segmented characters is proposed. Perfect rejection is shown to be achievable, but only at the cost of reduced classification accuracy in most practical situations. Human classification of a subset of the digit test suggests that there is considerable room for improvement in machine OCR before performance at the level of the proposed ideal is achieved.

00,295
PB93-147197 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
Effectiveness of Feature and Classifier Algorithms in Character Recognition Systems.
C. L. Wilson. Dec 92, 16p, NISTIR-4995.

Keywords: *Optical character recognition, Pattern recognition, Neural networks, Error analysis, Comparison, Accuracy, Algorithms, Feature extraction.

At the first Census Optical Character Recognition (OCR) Systems Conference, NIST generated accuracy data for more than 40 character recognition systems. Most systems were tested on the recognition of isolated digits and upper and lower case alphabetic characters. The recognition experiments were performed on sample sizes of 58,000 digits, and 12,000 upper and lower case alphabetic characters. The algorithms used by the 26 conference participants included rule-based methods, image-based methods, statistical methods, and neural networks. The neural network methods included Multi-Layer Perceptrons, Learned Vector Quantitization, Neocognitrons, and cascaded neural networks. In this paper, 11 different systems are compared using correlations between the answers of different systems, comparing the decrease in error rate as a function of confidence of recognition. This comparison shows that methods that used different algorithms for feature extraction and recognition performed with very high levels of correlation. This is true for neural network systems, hybrid systems, and statistically based systems, and leads to the conclusion that neural networks have not yet demonstrated a clear superiority to more conventional statistical methods.

00,296
PB93-152155 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
Machine-Assisted Human Classification of Segmented Characters for Optical Character Recognition Testing and Training.
R. A. Wilkinson, M. D. Garris, and J. Geist. Dec 92, 14p, NISTIR-5105.
See also PB92-238542.

Keywords: *Handwriting, *Data bases, *Tests, Errors, Classifying, Computer aided evaluation, Verifying, Interactive systems, *OCR(Optical Character Recognition), Character segmentation, NIST(National Institute of Standards and Technology).

The National Institute of Standards and Technology (NIST) needed a large set of segmented characters for use as a test set for the First Census Optical Character Recognition (OCR) Systems Conference. A machine-assisted human classification system was developed to expedite the process. The testing set consists of 58,000 digits and 10,000 upper and lower case characters entered on forms by high school students and is distributed as Testdata 1. A machine system was able to recognize a majority of the characters but all system decisions required human verification. The NIST recognition system was augmented with human verification to produce the testing database. The augmented system consists of several parts: the recognition system; a checking pass; a correcting pass; and a clean up pass. The recognition system was developed at NIST. The checking pass verifies that an image is in the correct class. The correcting pass allows classes to be changed. The clean-up pass forces the system to stabilize by accepting images with verified classifications while rejecting all others. In developing the testing set the authors discovered that segmented characters can be ambiguous even without context bias. The ambiguity can be caused by over-segmentation or by the way a person writes. This means that a quoted accuracy rate for a set of segmented characters is meaningless without reference to human performance on the same set of characters.

00,297
PB93-159077 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.

Cross Validation Comparison of NIST OCR Databases.
P. J. Grother. Jan 93, 15p, NISTIR-5123.
See also PB92-238542.

Keywords: *Optical character recognition, *Data bases, *Comparison, Algorithms, Handwriting, Classifying, Performance evaluation, *National Institute of Standards and Technology.

The quality of reference databases for Optical Character Recognition (OCR) is vital to the meaningful assessment of classification algorithms. The National Institute of Standards and Technology (NIST) has produced two databases of segmented handprinted characters obtained from socially distinct writer populations. Two approaches to the comparison of the databases are described. The first uses the eigenvalue spectrum of the covariance matrix as an a priori measure of the variance intrinsic to the data. The second cross validates the datasets using classification error to quantify the difficulty of OCR. The eigenvalue spectra from the training partitions of the datasets are generated during the production of the Karhunen Loeve (KL) Transforms, the leading components of which are used as prototype features for a classifier. The eigenspectra are used to quantify diversity of the character sets and the Bhattacharrya distance is used to measure class separability. The results for digits suggest that the second NIST database (used nominally for testing) is significantly harder than the first (training) set; the testing images are 11 percent more variable.

00,298
PB93-162980 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
Methods for Evaluating the Performance of Systems Intended to Recognize Characters from Image Data Scanned from Forms.
M. D. Garris. Feb 93, 27p, NISTIR-5129.
See also PB93-120707.

Keywords: *Optical character recognition, *Performance evaluation, Systems analysis, Image processing, Forms(Paper), Data bases, Testing, Scoring.

The concepts presented in the paper were developed to establish a uniform method of evaluating the recognition of optical character readers used to process the information on forms which receive information as a bit stream directly or indirectly from scanners. Many large data entry systems are being designed to collect data from specified areas of forms, some of which may be multipart and completed with machine-printed or hand-printed characters. As the technology continues to advance, the number of commercially available products is increasing. Multiple products are emerging, all of which are designed to solve optical character recognition (OCR) applications. Improved recognition algorithms have enabled the accuracy of these products to steadily increase, but each product is based on a different, often proprietary set of algorithms. This presents potential users of OCR technology with many different choices and options and leads to a series of significant questions: How does a person determine when the technology has matured enough to make it economically advantageous to deploy; How does a potential user determine which product is best for his or her specific needs; How can a system developer, who has the ability to choose from a large variety of diverse algorithmic approaches, intelligently choose and then track progress when developing OCR systems. The answer to these questions lies in objective system performance measurement. This is the motivation behind the paper.

00,299
PB93-178861 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
Statistical Analysis of Information Content for Training Pattern Recognition Networks.
C. L. Wilson. Mar 93, 16p, NISTIR-5149.

Keywords: *Pattern recognition, *Neural nets, *Machine learning, Mathematical models, Statistical analysis, Optical character recognition, Dermatoglyphics.

Statistical models of neural networks predict that the difference in training and testing error will be linear in network complexity and quadratic in the feature noise of the training set. Models of this kind have been applied to the Boltzmann pruning of a large Multi-Layer Perception (MLP) (3786 weights) trained on 10,000 and tested on 10,000 Karhunen-Loeve (K-L) features derived from images of handprinted characters and to a fingerprint classification problem which has 17,157 weights and is trained and tested on 2,000 K-L feature sets. Using the information content to optimize network size, the pruned networks have achieved high rates of recognition and at the same time been reduced in size by up to 90 percent. In the pruning process the product of the network capacity and the recognition error can be used effectively to select an optimum pruned network. If, in addition to conventional Boltzmann weight reduction, a weight reduction method which takes the variance content of the K-L by weighing the features using the K-L eigenvalues is used, networks with optimal size and information content can be constructed.

00,300
PB93-184273 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
Comparative Performance of Classification Methods for Fingerprints.
G. T. Candela, and R. Chellappa. Apr 93, 50p, NISTIR-5163.
Prepared in cooperation with Maryland Univ., College Park. Dept. of Electrical Engineering.

Keywords: *Dermatoglyphics, *Pattern recognition, *Classifying, Neural nets, Parallel processing, Computation, Feature extraction, Data bases, Preprocessing, *Fingerprint classification, National Institute of Standards and Technology.

The document reports the results of several pattern classifiers as tested on the National Institute of Standards and Technology (NIST) Special Database 4, which consists of fingerprint images produced from two rollings of each of 2,000 different fingers. The fingerprints are to be classified into five broad classes known as Arch, Tented Arch, Left Loop, Right Loop, and Whorl. The classifiers tested are drawn from traditional pattern recognition literature (minimum distance, maximum a posteriori, nearest neighbor) as well as neural network literature (multilayer perception, radial basis functions, probabilistic neural network). To enable a fair comparison of the classifiers, preprocessing steps such as enhancement and feature extraction are kept the same for all the classifiers. Classification accuracies for all the classifiers are tabulated for the case when they are trained on fingerprints from one rolling and tested on fingerprints from a different rolling. The effect of feature vector dimension on classifier accuracies is indicated. Computational and memory requirements of the classifiers are compared.

00,301
PB93-184422 PC A07/MF A02
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Robot Systems Div.
Binocular Spherical Disparity: A Study in Representation for a Forward Translating Camera.
D. J. Orser. Jun 92, 136p, NISTIR-4865.

Keywords: *Computer vision, *Imaging techniques, Pattern recognition, Stereoscopic vision, Scene analysis, Cameras, *Robot vision, Image segmentation, Optical flow, Binocular disparity.

The problem of interpreting optical flow and binocular disparities for a forward translating camera is addressed. A solution is offered in the form of image remappings which convert the images to the analogous well understood case for a laterally translating camera. After reviewing this latter case, a binocular camera-retina imaging model utilizing spherical projection and foveal peripheral resolution is described for analyzing both binocular disparity and optical flow. The result provides the basis for analyzing both types of disparities within a single framework for the purpose of understanding how these 'orthogonal' sources of information can be exploited in a computational model. The process of image remapping, called 'normalization,' is then defined for four 1-D parameterizations of 3-D space: range, depth, looming and clearance. It is shown that normalization transforms optical flow into a form analogous to that for the laterally translating camera. In addition, it is shown how to obtain these same normalizations from standard planar projection images. A binocular wire frame scene simulator is used to experimentally verify the ideas. In addition a program for normalizing real iconic planar projection imagery is applied to several example images and the results demonstrated.

00,302
PB93-188126 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
NIST Scoring Package Certification Procedures in Conjunction with NIST Special Databases 2 and 6.
M. D. Garris. Apr 93, 27p, NISTIR-5173.
See also PB92-238542 and PB93-120707.

Keywords: *Certification, *Optical character recognition, *Performance evaluation, Computer software, Scoring, Data bases, Forms(Paper), Taxes, Systems analysis, *National Institute of Standards and Technology, Special Database 2(SD2), Special Database 6(SD6).

The procedures outlined in the report have been developed by the National Institute of Standards and Technology (NIST) in order to promote compliance with existing NIST Scoring Package file formats. Through certification, the proper use of the Scoring Package is promoted and the successful scoring of recognition system data is maximized. The certification procedures presented in the document have been developed in conjunction with NIST Special Database 2 (SD2) and NIST Special Database 6 (SD6). These two databases contain images of synthesized tax forms. The data entered on the forms appears real, but the values have been generated at random by a computer. NIST offers certification to any organization that has purchased the Scoring Package and requests the service.

00,303
PB93-206191 PC A03/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Applied and Computational Mathematics Div.
Computational Experience with Radial Basis Function Networks.
J. L. Blue. May 93, 16p, NISTIR-5168.

Keywords: *Character recognition, *Neural nets, Training, Computation, Graphs(Charts), *RBFs(Radial Basis Functions).

The report discusses the use of Radial Basis Functions for use in neural networks for hand-printed character recognition. The results are expected to apply to other applications of neural networks for classifying input patterns.

00,304
PB93-207959 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
Dictionary Production for Census Form Conference.
R. A. Wilkinson. Apr 93, 16p, NISTIR-5180.

Keywords: *Optical character recognition, *Character recognition, Optical scanners, Data reduction, Pattern recognition, Dictionaries.

There are two categories of data from which dictionaries can be produced. One uses old data or data from a previous collection and the other uses new data or data from a current collection. The old data creates dictionaries that can be used for possible answer examples, assisting optical character recognition (OCR) systems, and training of recognition systems. The new data is the most useful in testing and scoring system results. For each of the categories above there are two types of dictionaries. These types may be useful for work with the Second Census OCR Conference. The first contains all words that have occurred in the data set being used. The second dictionary can be built from the essential dictionary. The second dictionary is one which has the misspellings corrected, the abbreviations expanded, and all the words stemmed into logical minimal stems. A mapping between the essential dictionary to the second or exploratory dictionary is required.

00,305
PB94-103702 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
NIST Scoring Package Cross-Reference for Use with NIST Internal Reports 4950 and 5129.
M. D. Garris. Aug 93, 20p, NISTIR-5249.
See also PB92-238542, PB93-188126, PB93-120707 and PB93-162980.

Keywords: *Optical character recognition, *Performance evaluation, Standards, Nomenclature,

Scoring, Accumulators(Computers), Data bases, Forms(Paper), Systems analysis, *National Institute of Standards and Technology, *Cross-reference, NISTIR 4950, NISTIR 5129.

The Image Recognition Group at the National Institute of Standards and Technology (NIST) has developed a uniform method of evaluating the recognition of optical character readers used to process the information on electronically scanned forms. NIST Scoring Package Release 1.0, NIST Special Software 1 (SS1), is distributed on CD-ROM as a reference implementation of this uniform method. A public version of SS1 was released in October of 1992 along with 'NIST Scoring Package User's Guide Release 1.0' (NISTIR 4950). The User's Guide describes the reference implementation in great detail, but it does not address the theory used to derive the implementation itself. In February of 1993, the paper, 'Methods for evaluating the Performance of Systems Intended to Recognize Characters from Image Data Scanned from Forms' (NISTIR 5129), was written to replace the draft standard. NISTIR 5129 formalizes the theory used in the Scoring Package and establishes a uniform method of evaluation. In order to formalize these steps, NISTIR 5129 introduced a standard nomenclature for accumulator names. A cross-reference is presented to map this new nomenclature back to the pre-existing User's Guide (NISTIR 4950).

00,306
PB94-118213 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Advanced Systems Div.
Comparison of Handprinted Digit Classifiers.
P. J. Grother, and G. T. Candela. Jun 93, 20p, NISTIR-5209.

Keywords: *Character recognition, *Pattern recognition, Data bases, Neural nets, Image processing, Preprocessing, Algorithms, Feature extraction, Comparison.

We report recognition results for several pattern classifiers trained and tested on disjoint sets of 30620 digits selected from the first 500 writers of the National Institute of Standards and Technology (NIST) Special Database 3. The classifiers are ubiquitous in traditional pattern recognition literature (minimum distance, maximum a posterior, nearest neighbor) as well as neural network literature (multilayer perceptron, radial basis functions, probabilistic neural network). For the purpose of valid comparison of classifiers, fixed sets of Karhunen-Loeve Transforms produced from images preprocessed using the same methods for size and orientation normalization were used as features. The 'K-means' clustering algorithm is used to produce subclasses thereby supervising training and aiding recognition. Graphical displays of classification and associated confidences illustrate classifier complexity. Recognition error rates for all the classifiers are tabulated as a function of feature vector dimension. Computational and memory requirements of the different classifiers are also compared.

ELECTROTECHNOLOGY

General

00,307
PB93-125185 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
Benchmark for the Verification of Microwave CAD Software.
Final rept.
R. Furlow, R. Y. Shimoda, D. F. Williams, R. B. Marks, and K. C. Gupta. 1992, 10p.
Sponsored by Boeing Defense and Space Group, Seattle, WA., and Colorado Univ. at Boulder.
Pub. in Proceedings of ARFTG Conference Digest (38th), San Diego, CA., December 5-6, 1991, p97-106 1992.

Keywords: *Microwave equipment, *Computer aided design, *Computer program verification, Tests, Benchmarks, Computer software, Scatter propagation, Reprints.

A set of microstrip structures which constitute a comprehensive benchmark for the verification of microwave Computer Aided Design (CAD) software has been developed in a collaborative effort. The benchmark is designed to exhibit a wide range of physical mechanisms which may or may not be incorporated into commercial microwave CAD software. The structures are characterized experimentally with respect to a well understood calibration in which the reference impedance is set real.

00,308
PB93-143931 (Order as PB93-143923, PC A06/MF A02)
National Inst. of Standards and Technology, Gaithersburg, MD.
System for Measuring Conditional Amplitude, Phase, or Time Distributions of Pulsating Phenomena.
R. J. Van Brunt, and E. W. Cernyar. 1992, 38p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v97 n6 p635-672 Nov/Dec 92.

Keywords: *Electric discharges, Multi-channel analyzers, Dielectric breakdown, Stochastic processes, Pulse height analyzers, Electrical measurement, Amplitude, Phase, Time, *Partial discharges, Trichel pulses.

A detailed description is given of an electronic stochastic analyzer for use with direct 'real-time' measurements of the conditional distributions needed for a complete stochastic characterization of pulsating phenomena that can be represented as random point processes. The measurement system described here is designed to reveal and quantify effects of pulse-to-pulse or phase-to-phase memory propagation. The unraveling of memory effects is required so that the physical basis for observed statistical properties of pulsating phenomena can be understood. The individual unique circuit components that comprise the system and the combinations of these components for various measurements, are thoroughly documented. The system has been applied to the measurement of pulsating partial discharges generated by applying alternating or constant voltage to a discharge gap. Examples are shown of data obtained for conditional and unconditional amplitude, time interval, and phase-of-occurrence distributions of partial-discharge pulses.

00,309
PB93-150795 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Technology Div.
Low Temperature Magnetic Behavior of 'Nonmagnetic' Materials.
Final rept.
F. R. Fickett. 1992, 7p.
Pub. in Advances in Cryogenic Engineering Materials, v38 ptB p1191-1197 1992.

Keywords: *Magnetic properties, *Cryogenic equipment, Magnetic susceptibility, Cryogenic temperature, Magnetization, Magnetometers, Plastics, Alloys, Reprints, Magnetic impurities.

Designs for many superconductor systems, ranging from large magnets to thin film devices, require a knowledge of the magnetic properties of a wide range of materials. Commercial 'nonmagnetic' materials may show bizarre magnetic behavior as a function of temperature, changing from paramagnetic to diamagnetic, or vice versa, as the temperature is lowered, and sometimes even become ferromagnetic. In metallic alloys, whether these effects occur and at what temperature are often determined by the exact composition of the alloy, which is frequently correlated with its age. Furthermore, nonmetallic materials may have strong magnetic signatures which arise from magnetic impurities, such as inclusions of magnetite in the glass fibers of fiberglass epoxies. Here we summarize results of magnetic susceptibility measurements on a number of metallic alloys and some nonmetallic materials used in cryogenic applications. The data suggest that care should be taken in the use of many of these common materials, especially in the construction of sensitive magnetometer systems.

00,310
PB93-151793 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
High-Accuracy Sampling Wattmeter.
Final rept.
G. N. Stenbakken, and A. Dolev. 1992, 5p.
Pub. in Proceedings of IEEE (Institute of Electrical and Electronics Engineers) Instrumentation and Measurement Technology Conference, Secaucus, NJ., May 12-14, 1992, p568-572.

Keywords: *Wattmeters, Power measurement, Calibration, Hz range, Feasibility, Alternating current, Reprints, Sampling wattmeters, High accuracy.

A high-accuracy sampling wattmeter was developed at NIST (National Institute of Standards and Technology) to investigate the feasibility of using waveform sampling techniques for making very accurate power measurements at frequencies from 50 Hz to 1000 Hz. The prototype instrument is not portable but was used to demonstrate the accuracy achievable with the sampling method. The goal of this development was to build an instrument with an uncertainty of less than + or - 50 ppm over these frequencies. The new high-accuracy sampling wattmeter was built around a previous wideband instrument developed earlier at NIST. The new wattmeter uses 16-bit converters and includes a two-stage current transformer in one of the modules. This wattmeter, as the previous wattmeter, operates with asynchronous sampling. The wattmeter has been calibrated using the NIST Audio-Frequency Power Bridge. The two instruments agreed to better than + or - 50 ppm of full scale over the 50 Hz to 1000 Hz frequency range at all power factors.

00,311
PB93-151827 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Technology Div.
Electrical Resistivity of Copper Alloys between 76 K and 300 K.
Final rept.
C. A. Thompson, and F. R. Fickett. 1992, 6p.
Pub. in Advances in Cryogenic Engineering (Materials), v38 p1177-1182 1992.

Keywords: *Copper alloys, *Electrical resistivity, Copper beryllium alloys, Temperature range 0065-0273 K, Temperature range 0273-0400 K, Temperature dependence, Cryogenic temperature, Yield strength, Reprints.

We have measured the electrical resistivity of UNS C10100, C10200, C10700, C11000, C15715, and C17510 alloys at ten equally spaced temperatures between 76 K and 300 K. Our results show that the variation of resistivity with temperature is nearly linear over the entire range for each alloy and that the higher resistivity materials have slightly higher slopes. An apparatus which has accurate temperature control and can simultaneously measure the resistance of eight samples is described.

00,312
PB93-151843 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Partial Discharge Pulse-Height Analysis: Promises and Limitations.
Final rept.
R. J. Van Brunt. 1991, 5p.
Sponsored by Department of Energy, Washington, DC. Office of Energy Storage and Distribution.
Pub. in Proceedings of International Symposium on Digital Techniques in High-Voltage Measurements, Toronto, Canada, October 28-30, 1991, p2-12-2-16.

Keywords: *Electric discharges, *Electric corona, Electrical measurement, Electrical insulation, Stochastic processes, Pulse amplitude, Reprints, *Partial discharges.

An alternative approach to measurement of the phase-resolved stochastic properties of partial-discharge pulses is described which can be used to unravel significant phase-to-phase memory propagation effects that give rise to nonstationary behavior in the observed pulse-height or phase-of-occurrence distributions. Examples are shown of data obtained using a point-to-dielectric discharge gap.

00,313
PB93-153120 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.

Electromagnetic Shielding of RF Gaskets Measured by Two Methods.
Final rept.
J. W. Adams. 1992, 4p.
Pub. in Proceedings of International Symposium on Electromagnetic Compatibility, Anaheim, CA., August 17-21, 1992, p154-157.

Keywords: *Electromagnetic shielding, *Gaskets, Electrical measurement, Performance evaluation, Transfer impedance, Effectiveness, Holders, Reprints.

An evaluation of two techniques and sample holders for measuring the electromagnetic shielding effectiveness of RF gaskets is given. Measured data and suggestions for refinements are also presented.

00,314
PB93-153138 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
Comparison Measurements of Currents Induced by Radiation and Injection.
Final rept.
J. W. Adams, J. Cruz, and D. Melquist. 1992, 3p.
Pub. in IEEE (Institute of Electrical and Electronic Engineers) Transactions on Electromagnetic Compatibility 34, n3 p360-362 Aug 92.

Keywords: *Electromagnetic compatibility, Electrical measurement, Electric current, Comparison, Reprints, Bulk current.

Measurements that show significant differences between currents measured in individual wires of a bundle due to equal current excitations by external radiated fields or by bulk injection are reported. This raises concern whether bulk current injection is a reliable technique for EMC work.

00,315
PB93-153278 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
Reverberating Asymmetric TEM Cell for Radiated EMC/V and SE Testing, 10 kHz - 18 GHz.
Final rept.
M. L. Crawford, and B. F. Riddle. 1992, 8p.
See also PB92-165273.
Pub. in Proceedings of International Symposium on Electromagnetic Compatibility, Anaheim, CA., August 17-21, 1992, p206-213.

Keywords: *Electromagnetic compatibility, *Electromagnetic shielding, Reverberation chambers, Test facilities, Vulnerability, Effectiveness, Measurement, Reprints, *TEM cells.

The paper describes work in progress at the National Institute of Standards and Technology (NIST) to develop a single, integrated facility for electromagnetic compatibility/vulnerability (EMC/V) and shielding effectiveness (SE) testing over the frequency range of 10 kHz to 18 GHz. The facility consists of an asymmetric (offset center plate) TEM cell, 1.01 m x 1.20 m x 2.98 m in size, with two cavity mode tuners, configured as a TEM transmission line-driven, mode-stirred chamber. The paper discusses the cell design, advantages and limitations for its use, the theoretical basis for its operation, and the experimental approach for its use in SE or EMC/V testing. Results are given of the evaluation of the cell's operational parameters including VSWR, E-field amplitude versus input power, tuners' effectiveness, and test volume E-field uniformity.

00,316
PB93-153492 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
System Response to Pulsed Excitations Estimated from Measurement of cw Amplitudes.
Final rept.
M. T. Ma, and J. W. Adams. 1992, 4p.
Pub. in Proceedings of International Symposium on Electromagnetic Compatibility, Beijing, China, May 25-27, 1992, p29-32.

Keywords: *Systems engineering, Laplace transformation, Hilbert transformation, Continuous radiation, Transfer functions, Time response, Linear systems, Electromagnetic pulses, Network analysis, Excitation, Reprints.

A simple technique for determining the transfer function and the complete time characteristics of an unknown linear system from the measured amplitude response to cw excitations is described. The work is based on modern network theory. The system transfer function so determined may or may not be at minimum phase. The associated time responses can be calculated for all possible cases, thus revealing the worst case.

00,317
PB93-153567 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Improvements in the NIST Watt Measurement: Monitoring the Mass Stability of the Kilogram.
Final rept.
P. T. Olsen, W. L. Tew, and E. R. Williams. 1992, 2p.
Pub. in Conference Record for Conference on Precision Electromagnetic Measurements (CPEM '92), Paris, France, June 9-12, 1992, p123-124.

Keywords: Electrical measurement, Magnetic forces, Monitoring, Automation, Reprints, *Watt measurement, Induced voltage, Mass stability, Watt balance, Kilogram.

Considerable progress has been made toward the two orders of magnitude decrease of the experimental uncertainty of the NIST watt measurement from that previously reported. The rebuilding of the apparatus and electronics provides the automated measurement capability to obtain the statistical resolution required to study the system's behavior and the numerous possible sources of error.

00,318
PB93-153641 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
Optimized Thermo-Optic Electric-Field Probes for Microwaves and Millimeter Waves.
Final rept.
J. Randa, M. Kanda, and R. D. Orr. 1992, 4p.
Sponsored by Naval Ocean Systems Center, San Diego, CA.
Pub. in Proceedings of International Symposium on Electromagnetic Compatibility, Anaheim, CA., August 17-21, 1992, p200-203.

Keywords: *Electric probes, *Electric fields, Microwave equipment, Millimeter waves, Performance, Design, Reprints, Thermooptics.

We report the design and testing of electric-field probes for use at frequencies in the microwave and millimeter-wave range. The probes consist of a resistive element whose temperature rise is measured by an optically sensed thermometer. Design parameters of the resistive element were optimized theoretically, with empirical confirmation. The optimized probe has a flat response above about 13 GHz and can measure fields as small as 17 V/m.

00,319
PB93-198851 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
Shielded Open-Circuited Sample Holders for Dielectric and Magnetic Measurements of Liquids and Powders.
J. Baker-Jarvis, M. D. Janezic, and R. B. Stafford.
Mar 93, 33p, NISTIR-5001.
Prepared in cooperation with Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.

Keywords: *Magnetic measurement, *Holders, Dielectric properties, Coaxial cables, Powder(Particles), Permittivity, Permeability, Calibration, Uncertainty, Waveguides, Liquids, *Dielectric measurements.

The report overviews shielded open-circuit measurements and presents a comprehensive uncertainty analysis. The authors use a dominant-mode scattering formulation to develop an expression for the reflection coefficient in terms of bead and sample parameters. The formulation developed here eliminates the transformation through the various sections of the sample holder. The authors also extend the formulation to include magnetic measurements. The uncertainty analysis indicates a decrease in relative uncertainty with increasing sample length and with increasing frequency. The real part of the permittivity at low frequencies is very sensitive to measured phase of the reflection coefficient and sample length. The imaginary part of the permittivity of low-loss materials is not extremely sensitive to the sample length. For high-loss materials both the real and the imaginary parts of the permittivity are sensitive to the sample lengths.

00,320
PB93-228625 PC A11/MF A03
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD.
Electronics and Electrical Engineering Laboratory 1993 Program Plan: Supporting Technology for U.S. Competitiveness in Electronics.
J. F. Mayo-Wells. Aug 93, 228p, NISTIR-5213.
See also PB92-123082.

Keywords: *Electrical measurement, *Electronics industry, Semiconductor devices, Superconductors, Microwave equipment, Optical equipment, Optical fibers, Standards, Electromagnetic compatibility.

The U.S. electronics and electrical equipment industries are experiencing a major shortfall in the measurement capability needed for developing, marketing, and supporting more competitive products. The Electronics and Electrical Engineering Laboratory (EEEL) of the National Institute of Standards and Technology is responding with programs of measurement development supportive of a broad range of fields of electronics. These fields include semiconductors, superconductors, magnetics, microwaves, lightwaves (including lasers and optical fibers), electrical power, and video. Also addressed are several cross-cutting fields including electromagnetic compatibility, complex-system description, and complex-system testing.

00,321
PB94-110186 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
NIST Measurement Service for Electromagnetic Characterization of Materials.
J. H. Grosvenor. Aug 93, 14p, NISTIR-5006.

Keywords: *Electrical measurement, *Metrology, Microwave frequencies, Radio frequencies, Dielectric properties, Magnetic properties, Transmission lines, Coaxial cables, Cavity resonators, Permittivity, Permeability, Waveguides, Capacitors, Services, Automatic network analyzers, Reference materials, Round robins, Intercomparison, US NIST, EPM project.

The paper presents an overview of the special test/measurement services currently available at the National Institute of Standards and Technology for characterizing the dielectric and magnetic properties of materials at the rf and microwave frequencies. Many important applications of materials used throughout the electronics, microwave, aerospace, and communications industries, have created a significant and increased need for reliable data on the electromagnetic properties of such materials. The paper emphasizes recent improvements in metrology capabilities developed at NIST. These include the broadband (0.1 MHz to 18 GHz) transmission-line techniques and low-frequency parallel-plate capacitor methods. The paper also briefly addresses other facets of the NIST program, including the provision of dielectric and magnetic reference materials to customers and the organization of national round robin intercomparisons.

00,322
PB94-112547 PC A06/MF A02
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
Bibliography of the NIST Electromagnetic Fields Division Publications.
R. M. Lyons, and K. A. Gibson. Sep 93, 119p, NISTIR-5009.
Supersedes PB92-116367.

Keywords: *Electromagnetic fields, *Bibliographies, Electrical measurement, Dielectric properties, Electromagnetic interference, Electromagnetic noise, Remote sensing, Time domain, Radiation hazards, Near field, Antennas, Metrology, Waveforms, Standards, Microwaves, Attenuation, Nonionizing radiation, US NIST.

The bibliography lists the publications by the staff of the Electromagnetic Fields Division of the National Institute of Standards and Technology for the period January 1970 through July 1993. It supersedes NISTIR 3993 which listed the publications of the Electromagnetic Fields Division from January 1970 through July 1992. Selected earlier publications from the Division's predecessor organizations are included. Key words include: antennas; dielectric measurements; electromagnetic interference; microwave metrology; microwave power; impedance; attenuation; near-field

General

antenna measurements; noise; non-ionizing radiation; radiation hazards; standards; time domain; waveform metrology.

00,323
PB94-123056 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD.
Results of Screened-Room Measurements on NIST Standard Radiators.
G. Koepke, and J. Randa. Oct 93, 38p, NISTIR-5010.
See also PB92-187020.

Keywords: Electromagnetic interference, Electromagnetic compatibility, Interlaboratory comparisons, Radiation sources, Field strength, Spherical configuration, Monopoles, Dipoles, Graphs(Charts), *Standard radiators, Screened rooms, MIL-STD-462.

The National Institute of Standards and Technology (NIST) has recently developed a spherical-dipole standard radiator for use in electromagnetic interference and compatibility (EMI/EMC) applications. This report discusses results of a study of measurements of radiated emissions from the NIST spherical-dipole standard radiator in several screened rooms. The measurements were performed in accordance with MIL-STD-462 (1967). Large differences occur in the field intensity measured at different laboratories and even on different days at the same laboratory. There is also a systematic difference at low frequencies between the screened-room results and results obtained in a TEM cell, open-area test site, and anechoic chamber. Results obtained using a monopole radiator are also presented and discussed.

Antennas

00,324
PB93-153393 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
Ultra-Broadband and Nondispersive Sensor for the Measurement of Time-Domain Signals.
Final rept.
M. Kanda, and A. R. Ondrejka. 1991, 14p.
Pub. in Proceedings of Symposium on Electromagnetic Security for Information Protection, Rome, Italy, November 21-22, 1991, p65-78.

Keywords: *Signal detection, Electrical measurement, Time domain, Broadband, Antennas, Sensors, Reprints, TEM horns.

The paper discusses an ultra-broadband and nondispersive antenna for the measurements of time-domain signals. The resistively loaded TEM horn with the active cross-over network has a nearly constant amplitude and phase response from 2 kHz to 800 MHz. The upper frequency response, up to 1 GHz, is limited by the active cross-over network. Its antenna transfer function is on the order of -22 dB relative to 1 V output for 1 V/m.

00,325
PB93-153419 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
New Spherical Dipole Source.
Final rept.
G. Koepke, L. D. Driver, K. Cavcey, M. Kanda, K. Masterson, and R. Johnk. 1992, 8p.
Pub. in Proceedings of International Symposium on Electromagnetic Compatibility, Anaheim, CA., August 17-21, 1992, p98-105.

Keywords: *Dipole antennas, Electromagnetic fields, Optical fibers, Remote control, Spherical configuration, Sources, Reprints.

We have developed a spherical dipole electromagnetic source that can be characterized both by theory and experiment and integrated into modern automated test systems. The frequency and amplitude of the radiated electromagnetic field are established remotely using a signal generator. This signal and all other control features are transmitted to and from the sphere using optical fiber cable. The field measurements show good agreement with predictions over much of the frequency band.

00,326
PB93-235208 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
Dual-Port Circularly Polarized Probe Standards at the National Institute of Standards and Technology.
M. H. Francis, K. MacReynolds, and S. Canales. Aug 93, 38p, NISTIR-5007.

Keywords: *Antennas, *Measurement, *Circular polarization, Electromagnetic fields, Standards, Design criteria, Probes, Frequency standards.

The National Institute of Standards and Technology has acquired dual-port circularly polarized probes to use as gain and near-field probe standards for measuring circularly polarized test antennas. These probes will serve as standards for the 18 to 26.5, 33 to 50, and 50 to 70 GHz frequency bands. The paper discusses the need for such standards, their design requirements, the measurement results for gain, polarization, and pattern, and an uncertainty analysis of the measurements.

Circuits

00,327
PB93-143949 (Order as PB93-143923, PC A06/MF A02)
National Inst. of Standards and Technology, Boulder, CO.
High Power CW Wattmeter Calibration at NIST.
G. Rebuldela, and J. A. Jargon. 1992, 15p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v97 n6 p673-687 Nov/Dec 92.

Keywords: *Wattmeters, *Calibration, MHz range 01-100, MHz range 100-1000, Continuous radiation, Power measurement, High power, Automation, Uncertainty, Cascaded coupler technique, US NIST.

The National Institute of Standards and Technology has established a measurement capability to support high power systems and devices. The automated wattmeter calibration system operates at power levels of 1 to 1000 W for frequencies from 1 to 30 MHz and 1 to 500 W from 30 to 400 MHz. A cascaded coupler technique is used to extend power measurements to high levels which are traceable to a 10 mW standard thermistor mount. The technique uses an arrangement of nominal 10, 20, 30, 40, and 50 dB couplers with sidearm power meters. The initial step transfers the calibration of the 10 mW standard to the 10 dB coupler/power meter. The standard is then replaced with a wattmeter to be calibrated. RF power is increased 10 dB and the calibration is transferred to the adjacent 20 dB coupler/power meter. The sequence is repeated with the remaining coupler/power meters until the wattmeter is calibrated at the desired power levels and frequencies. Power ratios calculated from simultaneous power measurements made at each transfer are used to calculate the incident power at the wattmeter.

00,328
PB93-150688 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Binary Inductive Voltage Divider Bridge.
Final rept.
S. Avramov, N. M. Oldham, and D. G. Jarrett. 1992, 5p.
See also PB93-135572.
Pub. in Proceedings of National Conference of Standards Laboratories, Washington, DC., August 2-6, 1992, p623-627.

Keywords: *Electric bridges, *Voltage dividers, KHz range 01-100, Hz range, Calibration, Automation, Linearity, Reprints, Inductive voltage dividers.

An automatic bridge to calibrate inductive voltage dividers from 10 Hz to 100 kHz is described. The bridge is based on a programmable 30-bit binary inductive voltage divider with terminal linearity of 0.1 ppm at 100 Hz (linearity degrades to 10 ppm at frequency extremes). Measurements of programmable test dividers can be completely automated via the General Purpose Interface Bus (GPIB) using software developed to align the bridge components and perform an auto balance.

00,329
PB93-150704 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Automated System for the Measurement of High-Valued Resistors.
Final rept.
P. A. Boynton. 1992, 5p.
See also PB93-129377.
Pub. in Proceedings of National Conference of Standards Laboratories, Washington, DC., August 2-6, 1992, p617-621.

Keywords: *Electrical resistance, *Resistors, Electrical measurement, Calibration, Automation, Reprints, *Resistance standards, Loss of charge method, Capacitance discharge method.

An automated method for measuring high-valued resistors is described. It is based on a loss-of-charge method, involving the discharge of a standard capacitor through an unknown resistor. This system is intended to calibrate standards ranging from 10(sup 10)ohm to 10(sup 14)ohm.

00,330
PB93-151132 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Automated AC Bridge for Resistance Measurements.
Final rept.
D. G. Jarrett. 1992, 5p.
See also PB93-129419.
Pub. in Proceedings of National Conference of Standards Laboratories, Washington, DC., August 2-6, 1992, p563-567.

Keywords: *Electrical resistance, *Kelvin bridges, Electrical measurement, Frequency dependence, KHz range 01-100, Hz range, Voltage dividers, Phase angle, AC systems, Automation, Reprints.

An automated, guarded ac Kelvin bridge has been developed for measuring the frequency dependence of precision resistors from the 1-ohm to the 1-M(ohm) level over the frequency range of 10 Hz to 10 kHz. The main ratio arms consist of two-stage 30-bit binary inductive voltage dividers. A guard inductive voltage divider drives a RC network to provide a known phase compensation to balance the quadrature component of the bridge. A bridge substitution technique is used in which the unknown is compared to a standard of known impedance. The bridge resolution is better than 0.1 ppm for the in-phase and quadrature components.

00,331
PB93-151173 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
NMR Based Current/Voltage Source.
Final rept.
C. G. Kim, E. R. Williams, H. Sasaki, W. L. Tew, S. Ye, and P. T. Olsen. 1992, 2p.
Pub. in Proceedings of Conference Record for Conference on Precision Electromagnetic Measurements, Paris, France, June 9-12, 1992, p414-415.

Keywords: *Nuclear magnetic resonance, Gyromagnetic ratio, Magnetic fields, Electrical measurement, Precision, Stability, Reprints, *Current sources, *Voltage sources.

A one-ampere current has been stabilized using nuclear magnetic resonance (NMR) techniques. A pair of tandem solenoids produce two uniform magnetic fields in opposite directions and these fields are not affected by external magnetic shielding. The current and background field are controlled to 0.1 ppm in three hours.

00,332
PB93-151181 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Intercomparison of NIST, NPL, PTB, and VSL Thermal Voltage Converters from 100 kHz to 1 MHz.
Final rept.
J. R. Kinard, R. B. D. Knight, P. Martin, J. Dessens, M. Klonz, and J. P. M. de Vreede. 1992, 5p.
See also PB93-129328.
Pub. in Proceedings of National Conference of Standards Laboratories, Washington, DC., August 2-6, 1992, p557-561.

Keywords: KHz range 100-1000, Interlaboratory comparisons, Reprints, *Thermal voltage converters, Thermal converters.

Coaxial, thermal voltage converters (TVC's) have been hand-carried among NIST, NPL, PTB, and VSL for intercomparison of ac-dc difference from 100 kHz to 1 MHz. This paper briefly describes the methods and underlying principles on which ac-dc difference determinations are based in each laboratory and gives the results of the intercomparisons.

00,333
PB93-151223 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Low-Frequency Errors of Thermal Voltage Converters: A Progress Report.
Final rept.
T. E. Lipe. 1992, 4p.
Pub. in Proceedings of National Conference of Standards Laboratories, Washington, DC., August 2-6, 1992, p543-546.

Keywords: Extremely low frequency, Hz range, Progress report, Errors, Reprints, *Thermal voltage converters, *Thermal current converters, Thermal converters.

Characteristics of thermal voltage converters (TVC's) and thermal current converters (TCC's) at low frequencies (below 100 Hz) are discussed. This frequency range is the region where the TVC's cease the thermal averaging of the ac input signal. The variation in ac-dc difference as the frequency of the input signal decreases is examined using various devices having differing thermal time constants. The data gathered experimentally using these devices are compared to predictions made using theoretical models of the TVC's at low frequencies and these results discussed. It is expected that this research will lead to improved accuracies for the NIST ac voltage and current calibration service at low frequencies.

00,334
PB93-151819 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Flux Locked Current Source Reference.
Final rept.
W. L. Tew, and E. R. Williams. 1992, 2p.
Pub. in Conference Record for Conference on Precision Electromagnetic Measurements (CPEM'92), Paris, France, June 9-12, 1992, p70-71.

Keywords: SQUID devices, Quantization, Stability, Reprints, *Current sources, Flux transformers, Voltage references.

The quantization of flux in a closed superconducting circuit is used to provide a stable reference current. A 10 mA current source is coupled via a toroidal transformer to a dc SQUID input and the resulting signal fed back as an error current. The result is a net current that exhibits stability of 1 x 10(sup -9) per hour and is quantized with a step of 59.4 nA. This current is sourced through a precision 100 ohm resistor and compared against Zener and standard cell voltage references.

IEEE Trans IM 34-38 '93

00,335
PB93-151884 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
NIST Sampling System for the Calibration of Phase Angle Generators from 1 Hz to 100 kHz.
Final rept.
B. C. Waltrip, M. E. Parker, N. M. Oldham, and B. A. Bell. 1992, 4p.
Pub. in Proceedings of National Conference of Standards Laboratories, Washington, DC., August 2-6, 1992, p613-616.

Keywords: *Phase meters, *Calibration, KHz range 01-100, Hz range, Wave forms, Sine waves, Linearity, Sampling, Reprints, *Phase angle generators, Phase standards.

A system for calibrating phase angle standards and phase meters from 1 Hz to 100 kHz is described. A commercial dual-channel waveform sampler is used to digitize both waveforms of the generator. The phase relationship between the two signals is resolved to less than 0.001 deg (17 microrad) using a four-parameter sine fit. The uncertainty in phase linearity is 0.001-0.010 deg over the frequency range.

00,336
PB93-151892 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Sampling Technique for Calibrating Phase Angle Generators from 1 Hz to 100 kHz.
Final rept.
B. C. Waltrip, M. E. Parker, N. M. Oldham, and B. A. Bell. 1992, 2p.
Pub. in Proceedings of Conference on Precision Electromagnetic Measurements (CPEM'92), Paris, France, June 9-12, 1992, p421-422.

Keywords: *Calibration, KHz range 01-100, Hz range, Wave forms, Sine waves, Phase meters, Reprints, *Phase angle generators, Phase standards.

A method of calibrating phase angle generators from 1 Hz to 100 kHz is described. A commercial dual-channel waveform sampler is used to digitize both waveforms of the generator. The phase relationship between the two signals is resolved to 0.001 deg (17 microrad) using a four parameter sine fit. The uncertainty in phase linearity is + or - 0.001 deg to 0.0l deg over the above frequency range.

00,337
PB94-108487 (Order as PB94-108461, PC A09/MF A02)
National Inst. of Standards and Technology, Boulder, CO.
Characteristics of Unknown Linear Systems Deduced from Measured CW Magnitude.
M. T. Ma, and J. W. Adams. 1993, 23p.
Included in Jnl. of Research of the National Institutes of Standards and Technology, v98 n3 p297-319 May/Jun 93.

Keywords: *Linear systems, *Network analysis, Continuous waves, Hilbert transformation, Laplace transformation, Rational functions, Transfer functions, Frequency response, Approximation, Impulse response.

A method is presented for predicting the total response, in both frequency and time, of an unknown linear system when only the measured continuous wave (cw) magnitude is available. The approach is based on approximating the square of the measured magnitude by a rational function, from which various system transfer functions in terms of complex frequency are deduced. These transfer functions may or may not be at minimum phase. The corresponding impulse response is then obtained by taking the inverse Laplace transform of the transfer function. The impulse response of the minimum-phase case rises faster initially to its first maximum than the nonminimum-phase counter-parts. This result confirms that, for the same cw magnitude response, the accumulative energy contained in the impulse response is the greatest when the transfer function is at minimum phase. Physical meaning of the energy content is also discussed.

00,338
PB94-112455 PC A04/MF A01
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
Microcalorimeter for 7 mm Coaxial Transmission Line.
Technical note.
F. R. Clague. Aug 93, 51p, NIST/TN-1358.
Also available from Supt. of Docs. as SN003-003-03241-7.

Keywords: *Power measurement, *Calorimeters, Electrical measurement, Transmission lines, Performance evaluation, Microcalorimetry, Calibration, Thermistors, Design, *Microwave microcalorimeters, Microwave power standards, Reference standards, US NIST.

Design, evaluation, and construction details are given for the coaxial microcalorimeter used by NIST as part of the microwave power standard in 7 mm coaxial transmission line. Two versions are described: one with Type N connector and one with an APC-7 connector. The operating frequency range is 0.01 to 18 GHz with either connector. The microcalorimeter is used to measure the effective efficiency of a reference standard, which is then used to calibrate other microwave power sensors. These reference standards are thermistor mounts designed by NIST to be compatible with the microcalorimeter. Detailed microcalorimeter drawings and assembly instructions are included.

Optoelectronic Devices & Systems

00,339
N93-27779/6 (Order as N93-27726/7, PC A99/MF A06)
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Technology Div.
Electrical and Infrared Properties of Thin Niobium Microbolometers Near T(sub c).
E. N. Grossman, J. E. Sauvageau, and D. G. Mcdonald. 1992, 11p.
In Michigan Univ., the Third International Symposium on Space Terahertz Technology: Symposium Proceedings p 643-653. Sponsored in Part by Strategic Defense Initiative Organization.

Keywords: *Bolometers, *Infrared detectors, Critical temperature, Niobium, Spiral antennas, Superconducting devices, Electrical properties, Hysteresis, Temperature dependence, Volt-ampere characteristics, *Microbolometers.

Niobium microbolometers approximately 1 micron wide x 2 micron long x 10 nm thick have been integrated at the feeds of equlangular spiral antennas made of 200 nm thick Nb. The device's current-voltage characteristics and infrared responsivity as a function of DC bias voltage were measured over a range of temperature spanning approximately plus or minus 2 percent around T(sub c). The greatest voltage responsivity occurs well below T(sub c), in a regime where the I-V curve is significantly hysteretic due to self-heating and resembles the I-V curve of a superconducting microbridge.

00,340
PB93-153807 Not available NTIS
National Inst. of Standards and Technology (NEL), Boulder, CO. Electromagnetic Technology Div.
Integrated Optic Laser Fabricated by Field-Assisted Ion Exchange in Neodymium Doped Soda-Lime Silicate Glass.
Final rept.
N. A. Sanford, K. J. Malone, and D. R. Larson. 1990, 3p.
Pub. in Optics Letters 15, n7 p366-368, 1 Apr 90.

Keywords: *Waveguide lasers, Continuous wave lasers, Infrared lasers, Near infrared radiation, Integrated optics, Doped materials, Neodymium, Silicates, Reprints.

A continuous-wave channel waveguide laser operating at 1057 nm has been fabricated in neodymium-doped soda-lime silicate glass by field assisted ion exchange. Threshold for pumping at 528 nm is 31 mW. Slope efficiency is 0.5%.

00,341
PB94-108776 PC A05/MF A01
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD.
Metrology for Electromagnetic Technology: A Bibliography of NIST Publications.
A. J. Smith. Sep 93, 83p, NISTIR-5008.
Supersedes PB92-116375.

Keywords: *Metrology, *Bibliographies, Optical communication, Optical fibers, Fiber optics, Optoelectronic devices, Electrooptics, Solid state lasers, Superconducting devices, Superconductors, Magnetic measurement, Cryogenics, *Electromagnetic metrology, Cryoelectronics, US NIST.

The bibliography lists the publications of the personnel of the Electromagnetic Technology Division of NIST during the period from January 1970 through publication of this report. A few earlier references that are directly related to the present work of the Division are also included. Keywords include cryoelectronics, electromagnetic metrology, lasers, optical fibers, and superconducting materials.

00,342
PB94-118403 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Semiconductor Electronics Div.
Electronics and Electrical Engineering Laboratory Technical Publication Announcements Covering Laboratory Programs, April to June 1993 with 1993/1994 EEEL Events Calendar.
J. M. Rohrbaugh. Oct 93, 13p, NISTIR-5275.
See also PB93-234698.

Keywords: *Microelectronics, *Metrology, *Bibliographies, Dimensional measurement, Optical fi-

bers, High temperature superconductors, Electric contacts, Laser beams, Electrical measurement, Electric current, Magnetic recording, Integrated optics, Waveguide lasers, Erbium glass lasers, Electric power, Photodetectors, Magnetic measurement, Abstracts, Fiber optic sensors, Yttrium barium cuprates, Claddings.

This is the thirty-seventh issue of a quarterly publication providing information on the technical work of the National Institute of Standards and Technology, Electronics and Electrical Engineering Laboratory. This issue of the EEEL Technical Publication Announcements covers the second quarter of calendar year 1993. Abstracts are provided by technical areas for papers published. Main topic areas include: Semiconductor Microelectronics; Signal Acquisition, Processing, and Transmission; Electrical Systems; and Additional Information.

Power & Signal Transmission Devices

00,343
PB93-151124 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Space Charge Induced in Stressed Polyethylene.
Final rept.
N. Hozumi, J. Tanaka, A. S. DeReggi, and N. Nagusrinivas. 1989, 6p.
Pub. in IEEE (Institute of Electrical and Electronics Engineers) 1989 Annual Report: Conference on Electrical Insulation and Dielectric Phenomena, p253-258 1989.

Keywords: *Electrical insulation, *Polyethylene, *Electric wire, *Space charge, Degradation, Electrodes, Aging(Materials), Electric charge, Charge density, Reprints.

Measurements of space charge induced by poling have been made on XLPE samples cut from AC cables aged under different conditions. The approximately 220 micrometer thick samples were obtained by peeling. Gold electrodes were evaporated on the samples, the samples poled at approximately 0.12 MV/cm (2.75 kV per sample) for three hours at 70 C, and the space charge determined by the thermal pulse technique. The amount of space charge induced in different samples by identical poling conditions was larger in the samples with the longer exposure to AC stress. The total amount of space charge which could be induced by poling was also found to correlate with other parameters such as AC breakdown strength. In addition, the space charge dissipation rate was monitored for several weeks after poling. Samples aged at room temperatures with both electrodes grounded retained more than half their original space charge after one week. It is highly probable that space charge determinations will be a powerful method for estimating the degree of degradation of aged cables.

00,344
PB93-153211 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Technology Div.
Critical-Current Degradation in Nb3Sn Composite Wires Due to Locally Concentrated Transverse Stress.
Final rept.
S. Bray, and J. W. Ekin. 1992, 4p.
Sponsored by Department of Energy, Washington, DC.
Pub. in Advances in Cryogenic Engineering (Materials), v38 p643-646 1992.

Keywords: *Superconducting wires, *Critical current, Superconducting composites, Superconducting magnets, Stress measurement, Niobium stannides, Degradation, Reprints, Transverse stress.

The superconducting wires in an energized magnet coil are subjected to mechanical stresses caused by the Lorentz force. Previous measurements have shown that either axial tensile stress or transverse compressive stress, the two dominant stresses on the wire, can cause substantial degradation in the superconductor's critical current. The previous transverse stress measurements were made with uniformly applied stress; however, many superconductor applications employ cables where the strands experience stress concentrations at the points where they cross one another. For this study, a single stress concentration point was simulated by applying transverse stress to two Nb3Sn wires, which were crossed over one another at an angle, while measuring the critical current of one of the wires at magnetic fields up to 9 T. A comparison between the cross-over-transverse-stress measurements and the uniform-transverse-stress measurements shows a critical-current degradation at equivalent loads that is significantly greater for the cross-over situation due to the reduced area. However, these preliminary data indicate that the concentration effect can be simply predicted because the degradation in critical current is comparable at equivalent stress.

00,345
PB93-162865 PC A07/MF A02
National Inst. of Standards and Technology (EEEL), Boulder, CO. Optical Electronic Metrology Group.
Transfer Functions for Characterizing Multimode Optical Fiber Components.
S. Yang. Jan 93, 138p, NISTIR-3997.
See also AD-A218 459.

Keywords: *Optical fibers, *Fiber optics, Optical coupling, Transfer matrix method, Transfer functions, Coupled modes, Multimode, Optical connectors.

A mode transfer function approach is proposed to characterize optical fiber devices. The transfer function is used to analyze the accuracy of the mode transfer matrix, which is currently being used to characterize optical fiber devices. The analysis shows that the mode transfer matrix depends on launch condition. Based on the study of the physical process of two basic mode coupling mechanisms, that is, the scattering coupling and the overlap coupling, two basic transfer functions are derived. Mode transfer functions for fibers/cables, connectors/splices, and power splitters are formed using these two basic transfer functions. Results of a round-robin test and a concatenation experiment show that the transfer function is better than the transfer matrix in that it is independent of launch conditions, and thus can improve both the repeatability of measurements made by different laboratories and the prediction of concatenated results. The transfer function can also be used to analyze the structure of a device.

00,346
PB94-118056 PC A09/MF A02
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Proceedings: Open Forum on Surge Protection Application.
F. D. Martzloff. Aug 91, 184p, NISTIR-4657.
Sponsored by Electric Power Research Inst., Palo Alto, CA.

Keywords: *Surges, *Meetings, *Electrical faults, Electric power distribution, Overvoltage, Circuit protection, Voltage regulation, Circuits, Outages, Electric power failures.

National Power Laboratory is currently conducting the world's largest power quality study. This paper compares the first 270 site months of NPL data to the 270 site month Goldstein-Speranza (AT&T) power study. The scope and framework of each study is discussed. The data from both studies are presented using identical event threshold levels. Results of the comparison show major changes in the numbers and types of disturbances over the past ten years. The NPL and AT&T studies confirm the need for power conditioning and UPS equipment to protect computers and other sensitive loads.

Resistive, Capacitive, & Inductive Components

00,347
PB93-139079 PC A04/MF A01
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD.
NIST Measurement Service for DC Standard Resistors.
Technical note (Final).
R. F. Dziuba, P. A. Boynton, R. E. Elmquist, J. D. Neal, D. G. Jarrett, and T. P. Moore. Nov 92, 67p, NIST/TN-1298.
Also available from Supt. of Docs. as SN003-003-03190-9.

Keywords: *Resistors, *Calibration, Electrical measurement, Resistance bridges, Direct current, Current comparators, Quantum Hall effect, Resistance standards, US NIST.

At the National Institute of Standards and Technology (NIST), the U.S. representation of the ohm is based on the quantum Hall effect, and it is maintained and disseminated at various resistance levels by working reference groups of standards. This document describes the measurement systems and procedures used to calibrate standard resistors of nominal decade values in the resistance range from 10(sup -4) ohm to 10(sup 12) ohm. Resistance scaling techniques used to assign values to the working standards are discussed. Also included is an assessment of the calibration uncertainties at each resistance level.

00,348
PB93-153716 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Process Measurements Div.
New Approach to Calibration of Transducers Used in the Measurement of Dynamic Pressure and Temperature.
Final rept.
G. J. Rosasco, V. E. Bean, and W. S. Hurst. 1989, 7p.
Pub. in Proceedings of Navy Metrology Research and Development Program Conference Report, Corona, CA., April 1989, p32-38.

Keywords: *Temperature measurement, *Pressure measurement, *Pressure transducers, *Calibration, Raman spectroscopy, Dynamic response, Diatomic molecules, Nonlinear optics, Response functions, Reprints.

Diatomic gas molecules have a fundamental vibrational motion whose frequency is affected by pressure in a simple way. In addition, these molecules have well defined rotational energy levels whose populations provide a reliable measure of the thermodynamic temperature. Since populations can be determined by laser spectroscopy, the gas molecules themselves can serve as sensors of pressure and temperature. Through measurements under static conditions, the pressure and temperature dependence of the spectra of selected molecules is now understood. Preliminary feasibility studies suggest that by using coherent anti-Stokes Raman spectroscopy we will be able to measure dynamic pressure up to 10(Sup 8) Pa and dynamic temperature up to 1500 K with an uncertainty of 5%.

Semiconductor Devices

00,349
PB93-124782 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Semiconductor Electronics Div.
New Test Structure for the Electrical Measurement of the Width of Short Features with Arbitrarily Wide Voltage Taps.
Final rept.
R. A. Allen, M. W. Cresswell, and L. M. Buck. 1992, 3p.
Pub. in IEEE (Institute of Electrical and Electronics Engineers) Electron Device Letters 13, n6 p322-324 Jun 92.

Keywords: *Very large scale integration, *Integrated circuits, *Dimensional measurement, *Line width, Electrical measurement, Test methods, Thin films, Width, Reprints, Test structures.

Accurate determination of the linewidth of a narrow conducting film for VLSI applications using electrical test structure metrology has required that the length of the line be many times its width to minimize geometric error due to the finite width of the voltage taps. However, long lines obscure important local effects such as nonuniformities in the film. Shorter lines highlight such effects. This paper describes a method of measuring the width of a short line having taps of arbitrary width. The effect of the taps is measured and used in the extraction of the linewidth allowing the determination of local linewidth variations with confidence.

00,350
PB93-125649 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.

Reciprocity Relations for On-Wafer Power Measurement.
Final rept.
R. B. Marks, and D. F. Williams. 1992, 8p.
Pub. in Proceedings of ARFTG Conference Digest (38th), San Diego, CA., December 5-6, 1991, p82-89 1992.

Keywords: Characteristic impedance, Power measurement, Microwaves, Metrology, Wafers, Reprints, *Waveguide junctions, Scattering parameters, Reciprocity.

The implications of expressions relating the forward and reverse transmission coefficients of a waveguide junction derived from the Lorentz reciprocity condition are explored. The two terms in the relation, the phase of the reference impedance in the guide and a new reciprocity factor, lead to an asymmetric scattering parameter matrix when one of the transmission lines connected to the junction is lossy.

00,351
PB93-125896 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Semiconductor Electronics Div.
Controlled Interface Roughness in GaAs/AlAs Superlattices.
Final rept.
W. R. Miller, W. J. Boettinger, W. F. Tseng, J. Pellegrino, and J. Comas. 1992, 6p.
Pub. in Material Research Society Symposium Proceedings, Anaheim, CA., April 29-May 2, 1991, v230 p213-218 1992.

Keywords: *Superlattices, Molecular beam epitaxy, Aluminum arsenides, Gallium arsenides, X-ray diffraction, Interfaces, Reprints, Migration enhanced epitaxy, Heterostructures.

We report the results of our study of controlled interface roughness in low-order GaAs/AlAs superlattices. Samples were prepared using either the interrupted growth or the migration-enhanced epitaxy (MEE) technique. The samples were prepared with m atomic planes of GaAs and m atomic planes of AlAs (m x m) per modulation wavelength and repeated p times. For this study, m = 1 or 3. The samples were studied using x-ray diffraction. The interrupted growth samples both showed a split in one diffraction line indicating layers were not of integral order while the MEE samples showed no splitting, indicating integral order layers.

00,352
PB93-139038 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Semiconductor Electronics Div.
MAESTRO: A Front-End to the MAIN1 Program for Multiple-Angle Measurement of Silicon Dioxide Layers.
R. L. Mattis. Dec 92, 27p, NISTIR-4969.

Keywords: *Silicon dioxide, Dimensional measurement, Programming manuals, Refractive index, Software tools, Ellipsometry, Thickness, Substrates, Silicon, Fortran, MAESTRO computer program.

MAESTRO is an interactive program which serves as a front-end to the MAIN1 computer program for processing ellipsometric data. It is applicable when MAIN1 is used to characterize silicon dioxide layers on silicon substrates using a single pair of Delta-psi values, using repeated pairs of Delta-psi values taken at the same nominal angle of incidence, or using pairs of Delta-psi values taken at multiple angles of incidence. MAESTRO stands for Multiple-Angle Ellipsometry for Supplying Thickness and Refractive index Output. It consists of two FORTRAN programs and a VMS DCL command procedure. An implementation for MS-DOS is also available. MAESTRO is used to prepare the X.DAT file required by MAIN1 and to give this file and the MAIN1 output files user-defined names.

00,353
PB93-147163 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Semiconductor Electronics Div.
Electronics and Electrical Engineering Laboratory Technical Publication Announcements Covering Laboratory Programs, April to June 1992, with 1992/1993 EEEL Events Calendar.
E. J. Walters. Dec 92, 24p, NISTIR-4997.
See also PB93-120715.

Keywords: *Microelectronics, *Metrology, Semiconductor devices, Integrated circuits, Electronic packaging, Signal processing, Signal transmission, Electromagnetic interference, Antennas, Waveforms, Electromagnetic properties, Fiber optics, Sensors, Electro-optics, Electrical measurement, Superconductors, Abstracts.

The document is the thirty-third issue of a quarterly publication providing information on the technical work of the National Institute of Standards and Technology Electronics and Electrical Engineering Laboratory (EEEL). This issue of the EEEL Technical Publication Announcements covers the second quarter of calendar year 1992. It contains citations and abstracts for Laboratory publications published in the quarter. Entries are arranged by technical topic and alphabetically by first author within each topic. Major topics include: Fundamental Electrical Measurements; Semiconductor Microelectronics; Signal Acquisition, Processing, and Transmission; Electrical Systems; Electromagnetic Interference. Following each abstract is the name and telephone number of the individual to contact for more information on the topic. The issue also includes a calendar of Laboratory conferences and workshops planned for calendar year 1992/1993 and a list of sponsors of the work.

00,354
PB93-152098 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Semiconductor Electronics Div.
Metrologic Support for the DARPA/NRL-XRL Mask Program: Ellipsometric Analyses of SIC Thin Films on SI.
Final technical rept. Aug 91-Mar 92.
D. Chandler-Horowitz, N. V. Nguyen, J. F. Marchiando, and P. M. Amirtharaj. Jan 93, 21p, NISTIR-4860.
Sponsored by Defense Advanced Research Projects Agency, Arlington, VA.

Keywords: *Silicon carbides, *Ellipsometry, Amorphous materials, Surface roughness, Refractive index, Helium neon lasers, Photomasking, Substrates, Thin films, Film thickness, Coatings, X-ray lithography.

Ellipsometric analyses were performed on a number of amorphous SiC films grown on Si which are currently being considered for X-ray lithography (XRL) mask membranes. The analyses and conclusions presented here increase the accuracy with which the layer thicknesses can be determined. In addition, materials-related information such as the presence of surface roughness, Si and graphite phases, as well as densification can be discerned from the data. The sensitivity of ellipsometry to very small changes in the phase of light (= or < 0.002 deg) makes it an extremely accurate optical tool capable of detecting small changes in thickness or optical properties. Samples were measured by single-frequency and spectroscopic ellipsometry. The measurements were analyzed by using a number of models. Three models with increasing degree of complexity and sophistication for the amorphous SiC film are compared: an isotropic one-layer model, an isotropic two-layer model that accommodates a surface layer/region, and a uniaxial one-layer model to account for possible built-in strain in the film. The two-layer model was found to give the most consistent fit to the experimental data.

00,355
PB93-152106 PC A06/MF A02
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Semiconductor Electronics Div.
Test Guide for CMOS-On-SIMOX Test Chips NIST3 and NIST4.
J. C. Marshall, M. W. Cresswell, C. H. Ellenwood, M. E. Zaghloul, L. W. Linholm, and P. Roitman. Jan 93, 116p, NISTIR-4890.

Keywords: *Very large scale integration, *Integrated circuits, Chips(Electronics), MOSFET, CMOS, Tests, *Test chips, Test structures, SOI(Semiconductors), SIMOX.

A test chip set has been designed for process monitoring and device parameter extraction for a CMOS (Complementary Metal-Oxide-Semiconductor)-on-SOI (Silicon-On-Insulator) process. The chips contain structures which are common to a standard CMOS process as well as structures specifically designed for a SIMOX (Separation by the IMplantation of OXygen) process. NIST3 is 6380 micrometers x 4780 micrometers and contains several large-geometry MOSFETs, resistors, and capacitors. NIST4 is 1 cm x 1 cm and contains approximately 300 small-geometry test structures. The SIMOX specific structures found on these chips include MOSFETs, capacitors, interconnects, and pads. The report presents the information necessary to test NIST3 and NIST4. Design guidelines, technology file modifications, and data output specifications for NIST3 and NIST4 are discussed in a separate manual.

00,356
PB93-153286 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Semiconductor Electronics Div.
Directed-Graph Classifier of Semiconductor Wafer-Test Patterns.
Final rept.
M. W. Cresswell, D. Khera, L. W. Linholm, and C. E. Schuster. 1992, 9p.
Pub. in IEEE (Institute of Electrical and Electronics Engineers) Transactions on Semiconductor Manufacturing 5, n3 p255-263 Aug 92.

Keywords: *Integrated circuits, Artificial intelligence, Expert systems, Quality control, Fabrication, Diagnosis, Wafers, Reprints, Test structures, Directed graphs.

The paper describes a technique for training an expert system for semiconductor wafer fabrication process diagnosis. The technique partitions an existing set of electrically tested semiconductor wafers into groups so that all wafers within each group have similar spatial distributions of the electrical test data across selected die sites. The spatial distribution of test data from the selected die sites on each wafer is referred to as the test pattern of that wafer. The supposition is that test patterns reflect the known processing histories of the respective wafers. A directed graph that is developed by the partitioning algorithm then efficiently classifies a new incoming wafer to one of the groups established during partitioning on the basis of its test pattern. The technique is appropriate for any available test pattern, whether it is extracted from a test structure or from a functional integrated circuit device or from both.

00,357
PB93-153294 Not available NTIS
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Precision Engineering Div.
Imaging of Passivated III-V Semiconductor Surfaces by a Scanning Tunneling Microscope Operating In Air.
Final rept.
J. A. Dagata, W. Tseng, J. Bennett, J. Schneir, and H. H. Harary. 1992, 7p.
Pub. in Ultramicroscopy 42-44, p1288-1294 1992.

Keywords: *Scanning tunneling microscopy, *Passivation, *Surfaces, Aluminum gallium arsenides, Imaging techniques, Superlattices, Reprints.

A procedure is described for preparing stable GaAs and other III-V semiconductor surfaces for scanning tunneling microscope (STM) imaging under ambient conditions. The procedure involves the use of a dilute P2S5/(NH4)2S passivating solution, which produces a highly uniform, ultra-thin surface oxide. STM imaging with nanometer-scale resolution of a P2S5-passivated, Al(x)Ga(1-x)As/GaAs, x=0.1-0.4, compositional superlattice and a variable-period Al(0.51)Ga(0.49)As/GaAs superlattice is used to illustrate some of the properties of this passivation method.

00,358
PB93-153443 Not available NTIS
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Statistical Engineering Div.
Effect of Repetitive Swells on Metal-Oxide Varistors.
Final rept.
E. S. Lagergren, F. D. Martzloff, M. E. Parker, and S. B. Schiller. 1992, 10p.
Pub. in Proceedings of International Conference on Power Quality: End-Use Applications and Perspectives PQA '92 (2nd), Atlanta, GA., September 28-30, 1992, p1-10.

Keywords: *Varistors, *Surges, Power supply circuits, Transient response, Overvoltage, Swelling, Circuit protection, Aging(Materials), Semiconductor devices, Variable resistors, Reprints.

Neither the effects of repetitive swells on metal-oxide varistors, nor the natural occurrence of swells have been documented in the literature. The paper briefly describes a laboratory system capable of generating arbitrary swells and applying them to test varistors. A statistical experiment on five lots of varistors has been

performed and preliminary results are reported. Effects of amplitude, duration, and number of swell occurrences are assessed, using as a criterion the change in varistor nominal voltage from before to after the swell sequence.

00,359
PB93-153666 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
Millimeter Wave Metrology at the National Institute of Standards and Technology.
Final rept.
G. R. Reeve. 1991, 5p.
See also PB-290 019.
Pub. in Proceedings of NCSL Workshop and Symposium, Albuquerque, NM., August 19-22, 1991, p183-187.

Keywords: *Millimeter waves, *Integrated circuits, *Metrology, Electrical measurement, Gallium arsenides, Near field, Scanning, Reprints, Noise standards, US NIST.

Over the past several years there has been an increased interest in the use of millimeter waves for such diverse applications as wide band satellite communications, short range radar and vehicle traffic control, and a much expanded cellular personal telephone service. Recent developments in Gallium Arsenide fabrication and MMIC devices promise low cost, high performance circuits. Over the past five years the National Institute of Standards and Technology (NIST) has been engaged in a program to expand its measurement services in this region of the spectrum. This paper will describe the additions that have been made to these services and some of the technical challenges that were encountered during the process.

00,360
PB93-158632 PC A06/MF A02
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Semiconductor Electronics Div.
Electronics and Electrical Engineering Laboratory Technical Publication Announcements Covering Laboratory Programs, July to September, 1992 with 1992/1993 EEEL Events Calendar.
J. M. Rohrbaugh. Jan 93, 118p, NISTIR-5114.
See also PB93-147163.

Keywords: *Microelectronics, *Metrology, Integrated circuits, Signal processing, Dimensional measurement, Electromagnetic interference, Optical fibers, Magnetic materials, Magnetic measurement, Electrical measurement, Optical communication, Electric power, Superconductors, Fiber optics, Microwaves, Progress report, Abstracts.

The report is the thirty-fourth issue of a quarterly publication providing information on the technical work of the National Institute of Standards and Technology, Electronics and Electrical Engineering Laboratory. The issue of the EEEL Technical Publication Announcements covers the third quarter of calendar year 1992. Abstracts are provided by technical area for papers published this quarter. Major subject headings include the following: Fundamental electrical measurements; Semiconductor microelectronics; Signal acquisition, processing, and transmission; and, Electrical systems.

00,361
PB93-175404 PC A09/MF A03
National Inst. of Standards and Technology, Gaithersburg, MD. Automated Electronics Mfg. Programs.
Initial Graphics Exchange Specification Hybrid Microcircuit Application Protocol.
Technical note (Final).
C. Parks, R. McCollough, C. Azu, T. Makoski, L. Savage, and P. Toomey. Jan 93, 199p, NIST/TN-1295.
Also available from Supt. of Docs. as SN003-003-03202-6. See also PB91-120196. Sponsored by Naval Command, Control and Ocean Surveillance Center, San Diego, CA. Research Development Test and Evaluation Div.

Keywords: *Microcircuits, Computer aided design, Computer aided manufacturing, Specifications, Models, Tests, *Application Protocols, *IGES(Initial Graphics Exchange Specification), Concurrent engineering, HMA(Hybrid Microcircuit Assemblies).

An application protocol is an information systems view of a specific product. The view represents an agreement on the generic activities needed to design and fabricate the product, the agreement on the information needed to support those activities, and the specific constructs of a product data standard for use in transferring some or all of the information required. This applications protocol describes the data for hybrid microcircuits products in terms of a product description standard called the Initial Graphics Exchange Specifications (IGES). More specifically, the Hybrid Microcircuit Assembly (HMA or hybrid) IGES Application Protocol (AP) specifies the mechanisms for defining and exchanging computer-models and their associated data for hybrid microcircuits in IGES format. The AP defines the appropriateness of the data items for describing the geometry of the various parts of a hybrid microcircuit (shape and location), the connectivity, and the processing and material characteristics.

00,362
PB93-198877 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Semiconductor Electronics Div.
Electronics and Electrical Engineering Laboratory Technical Publication Announcements Covering Laboratory Programs, October to December, 1992 with 1992/1993 EEEL Events Calendar.
J. M. Rohrbaugh. May 93, 16p, NISTIR-5195.
See also PB93-158632.

Keywords: *Microelectronics, *Metrology, Dimensional measurement, Glow discharges, Integrated circuits, Signal processing, Electromagnetic interference, High temperature superconductors, Electrical measurement, Magnetic measurement, Waveguide lasers, Electric power, Circuit protection, Surges, Optical waveguides, Progress report, Abstracts, Reprints, Fiber optic sensors, Yttrium barium cuprates, Standard reference materials.

The publication is the thirty-fifth issue of a quarterly publication providing information on the technical work of the National Institute of Standards and Technology, Electronics and Electrical Engineering Laboratory (EEEL). This issue of the EEEL Technical Publication Announcements covers the fourth quarter of calendar year 1992. Abstracts are provided by technical area for papers published this quarter. Main topic areas include: Semiconductor Microelectronics; Signal Acquisition, Processing, and Transmission; Electrical Systems; and Electromagnetic Interference.

00,363
PB93-205516 PC A03/MF A01
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Semiconductor Electronics Div.
Center for Electronics and Electrical Engineering Technical Publication Announcements Covering Center Programs, April to June 1990, with 1991 CEEE Events Calendar.
J. A. Gonzalez. Feb 91, 30p, NISTIR-4520.
See also PB91-107201 and PB91-184754.

Keywords: *Semiconductor devices, *Metrology, Electromagnetic interference, Dimensional measurement, Integrated circuits, Bipolar transistors, Optical fibers, Electrical measurement, Millimeter waves, Optical waveguides, Microwaves, Photodetectors, Superconductors, Quantum wells, Lasers, Signal processing, Integrated optics, Progress report, Abstracts.

This is the twenty-fifth issue of a quarterly publication providing information on the technical work of the National Institute of Standards and Technology (formerly the National Bureau of Standards) Center for Electronics and Electrical Engineering. This issue of the Center for Electronics and Electrical Engineering Technical Publication Announcements covers the second quarter of calendar year 1990. Abstracts are provided by technical area for papers published this quarter. Topics discussed include the following: Semiconductor Technology Program; Signals and Systems Metrology Program; Fast Signal Acquisition, Processing, and Transmission; Electrical Systems; Electromagnetic Interference; Additional Information; 1991 CEEE Calendar; Sponsor List; and Key Contacts in Center, Center Organization.

00,364
PB93-205524 PC A03/MF A01
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Semiconductor Electronics Div.
Center for Electronics and Electrical Engineering Technical Progress Bulletin Covering Center Programs, April to June 1990, with 1990/1991 CEEE Events Calendar.
J. A. Gonzalez. Nov 90, 45p, NISTIR-4446.
See also PB91-159749 and PB90-265265.

Keywords: *Semiconductor devices, *Metrology, Electromagnetic interference, High temperature superconductors, Dimensional measurement, Integrated circuits, Bipolar transistors, Optical fibers, Electrical measurement, Signal processing, Microwaves, Millimeter waves, Optical waveguides, Electric power, Dielectric breakdown, Electric cables, Lasers, Progress report, Abstracts, Voltage standards, Fiber optic sensors.

This is the thirty-first issue of a quarterly publication providing information on the technical work of the National Institute of Standards and Technology (formerly the National Bureau of Standards) Center for Electronics and Electrical Engineering. This issue of the CEEE Technical Progress Bulletin covers the second quarter of calendar year 1990. Abstracts are provided by technical area for both published papers and papers approved by NIST for publication. Main topics include the following: Semiconductor Technology Program; Signals and Systems Metrology Program; Fast Signal Acquisition, Processing, and Transmission Electrical Systems; Electromagnetic Interference; Additional Information; 1990/1991 CEEE Calendar; Sponsor List; and Key Contacts in Center, Center Organization.

00,365
PB93-206233 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Microelectronics Dimensional Metrology Group.
Report on a Workshop for Improving Relationships between Users and Suppliers of Microlithography Metrology Tools.
R. D. Larrabee. Jun 93, 25p, NISTIR-5193.

Keywords: *Semiconductors(Materials), *Lithography, *Meetings, Semiconductor devices, Microelectronics, Electronics Industry, Metrology, Standards, Supplying, Vendors, Integrated circuits.

The report is a summary of the opinions and comments expressed at the User-Vendor Interface Workshop held in connection with the 1993 SPIE Symposium on Microlithography held in San Jose, California in March, 1993. It was prepared to serve as a starting point for any future activity concerned with improving relations at the interface between the user and supplier of the metrology tools used in the fabrication of integrated circuits, other semiconductor devices, magnetic tape heads, micromachines, etc. The workshop was attended by representatives from the user, supplier, and standards communities representing strong semiconductor interests, and many opinions and comments were expressed about problems and frustrations at the user-supplier interface.

00,366
PB93-219806 PC A07/MF A02
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Semiconductor Electronics Div.
Semiconductor Measurement Technology: A Collection of Computer Programs for Two-Probe Resistance (Spreading Resistance) and Four-Probe Resistance Calculations, RESPAC.
Final rept.
J. Albers, and H. L. Berkowitz. Jun 93, 148p, NIST/SP-400-91.
Also available from Supt. of Docs. as SN003-003-03219-1. Prepared in cooperation with Army Lab. Command, Fort Monmouth, NJ. Electronics Technology and Devices Labs.

Keywords: *Semiconductor devices, *Semiconductor materials, *Electrical resistance, Electrical measurement, Electrical resistivity, Electric probes, Laplace equation, Poisson equation, Computer programs, Computation, Fortran, *Spreading resistance, RESPAC system, Two point resistance, Four point resistance, Multilayers.

The report presents and describes a number of FORTRAN programs which may be used to perform two-probe resistance (spreading resistance) and four-probe resistance calculations for vertically nonuniform resistivity structures. These programs fall into three general categories. They are: (1) programs for calculating the two-probe resistance (spreading resistance) from the resistivity profile, (2) programs for calculating the resistivity profile from the two-probe resistance (the inverse of 1), and (3) programs for calculating the four-probe resistance from the resistivity profile. Programs in the first and third category are useful for understanding the effects of resistivity variations on the two-probe resistance (spreading resistance) and the four-probe resistance. Programs in the second cat-

egory are useful for extracting the resistivity profile from spreading resistance data (either measured or calculated). All of the programs are based upon the Schumann and Gardner solution of the multilayer Laplace equation. As such, local charge neutrality is assumed. The limitations of this assumption are described in the text.

00,367
PB93-228641 PC A03/MF A01
Materials and Metrology, Sunnyvale, CA.
Semiconductor Measurement Technology: Evolution of Silicon Materials Characterization: Lessons Learned for Improved Manufacturing.
W. M. Bullis. Jul 93, 46p, NIST/SP-400/92.
Also available from Supt. of Docs. as SN003-003-03224-7. Sponsored by National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Semiconductor Electronics Div.

Keywords: *Silicon, *Wafers, *Semiconductor devices, *Integrated circuits, History, Standards, Tests, Electronics industry, Chips(Electronics), Reprints, ASTM(American Society for Testing and Materials).

The growth of the silicon device and integrated circuit industry has been closely coupled with the development of materials characterization technology. The paper traces this development from the beginning, when the industry was young and each manufacturer had to grow its own materials, develop its processes, assemble its measurement systems from component instruments, and fabricate its processing equipment, to the present, when a complex infrastructure supports the industry. It also describes examples of both successful and unsuccessful developments in connection with other electronic materials.

00,368
PB93-234698 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD.
Electronics and Electrical Engineering Laboratory Technical Publication Announcements Covering Laboratory Programs, January to March, 1993 with 1993/1994 EEEL Events Calendar.
J. M. Rohrbaugh. Jul 93, 18p, NISTIR-5231.
See also PB93-198877.

Keywords: *Microelectronics, *Metrology, Integrated circuits, Signal processing, Electromagnetic interference, Electrical measurement, Magnetic measurement, Transmission lines, Circuit protection, Superconductors, Wattmeters, Antennas, Surges, CMOS, Progress report, Abstracts, SOI(Semiconductors), Microfabrication, SIMOX.

The publication is the thirty-sixth issue of a quarterly publication providing information on the technical work of the National Institute of Standards and Technology, Electronics and Electrical Engineering Laboratory. This issue of the EEEL Technical Publication Announcements covers the first quarter of calendar year 1993. Abstracts are provided by technical area for papers published this quarter. Main topic areas include: Semiconductor Microelectronics; Signal Acquisition, Processing, and Transmission; Electrical Systems; and Electromagnetic Interference.

00,369
PB94-108529 PC A08/MF A02
National Inst. of Standards and Technology, Gaithersburg, MD.
Journal of Research of the National Institute of Standards and Technology, July-August 1993. Volume 98, Number 4.
1993, 153p.
See also PB94-108537 through PB94-108552 and PB94-108461. Also available from Supt. of Docs. as SN703-027-00053-9.

Keywords: *Integrated circuits, *Metrology, Dimensional measurement, Line width, Lithography, Scanning electron microscopy, Calibration standards, Crystal chemistry, BSCCO superconductors, Calcium oxides, Bismuth oxides, Copper oxides, Cuprates, X-ray lithography, Magnification standards.

Contents:
X-Ray Lithography Mask Metrology--Use of Transmitted Electrons in an SEM for Linewidth Measurement;
Interlaboratory Study on the Lithographically Produced Scanning Electron Microscope Magnification Standard Prototype;
Phase Equilibria and Crystal Chemistry in Portions of the System SrO-CaO-Bi2O3-CuO, Part IV--The System CaO-Bi2O3-CuO.

00,370
PB94-108537 (Order as PB94-108529, PC A08/MF A02)
National Inst. of Standards and Technology, Gaithersburg, MD.
X-ray Lithography Mask Metrology: Use of Transmitted Electrons in an SEM for Linewidth Measurement.
M. T. Postek, J. R. Lowney, A. E. Vladar, R. D. Larrabee, W. J. Kerry, and E. Marx. 1993, 31p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n4 p415-445 Jul/Aug 93.

Keywords: *Integrated circuits, *Dimensional measurement, *Line width, *Lithography, Scanning electron microscopy, Electron beams, Microelectronics, Metrology, *X-ray lithography, X-ray masks, Secondary electrons, Transmitted electrons.

The paper shows that excellent contrast and signal-to-noise levels can be obtained using the transmitted-electron signal for mask metrology rather than the more commonly collected secondary electron signal. The work provides one approach to improved x-ray mask linewidth metrology and a more precise edge location algorithm for measurement of feature sizes on x-ray masks in commercial instrumentation. The work also represents an initial step toward the first SEM-based accurate linewidth measurement standard from NIST, as well as providing a viable metrology for linewidth measurement instruments of x-ray masks for the lithography community.

00,371
PB94-108545 (Order as PB94-108529, MF A02)
National Inst. of Standards and Technology, Gaithersburg, MD.
Interlaboratory Study on the Lithographically Produced Scanning Electron Microscope Magnification Standard Prototype.
M. T. Postek, A. E. Vladar, S. N. Jones, and W. J. Kerry. 1993, 21p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n4 p447-467 Jul/Aug 93.

Keywords: *Scanning electron microscopy, *Calibration standards, Integrated circuits, Comparative evaluations, Line width, Microelectronics, Prototypes, Metrology, Substrates, Lithography, Palladium, Titanium, Silicon, *Magnification standards, Interlaboratory comparisons, Nanostructures.

NIST is in the process of developing a new scanning electron microscope (SEM) magnification calibration reference standard useful at both high and low accelerating voltages. This standard will be useful for all applications to which the SEM is currently being used, but it has been specifically tailored to meet many of the particular needs of the semiconductor industry. A small number of test samples with the pattern were prepared on silicon substrates using electron beam lithography at the National Nanofabrication Facility at Cornell University. The structures were patterned in titanium/palladium with maximum nominal pitch structures of approximately 3000 micrometers scaling down to structures with minimum nominal pitch of 0.4 micrometers. Eighteen of these samples were sent out to a total of 35 university, research, semiconductor and other industrial laboratories in an interlaboratory study. The purpose of the study was to test the SEM instrumentation and to review the suitability of the sample design.

00,372
PB94-108636 PC A16/MF A03
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
RL/NIST Workshop on Moisture Measurement and Control for Microelectronics. Proceedings of the RL/NIST Workshop held in Gaithersburg, Maryland on April 5-7, 1993.
B. A. Moore, and J. A. Carpenter. Aug 93, 362p, NISTIR-5241.
See also PB87-224614. Sponsored by Rome Lab., Griffiss AFB, NY.

Keywords: *Semiconductor devices, *Integrated circuits, *Moisture content, *Microelectronics, *Meetings, Hermetic seals, Quality control, Reliability(Electronics), Gas analysis, Measurement, Packaging, Moisture meters.

The document is a compilation of papers presented at the title workshop, fifth in a series since 1978 addressing ingress mechanisms, effects, and methods of measuring moisture in electronic packages, mainly used in military and biological applications.

ENERGY

General

00,373
PB94-111853 PC A11/MF A03
National Inst. of Standards and Technology (TS), Gaithersburg, MD. Office of Technology Evaluation and Assessment.
Energy Related Inventions Program. Status Report for Recommendations 351 through 602.
Jun 93, 234p, NISTIR-5259.
Supersedes PB92-226273. See also PB92-226265 and Recommendations 1 through 350, PB94-111903. Sponsored by Department of Energy, Washington, DC. Inventions and Innovation Div.

Keywords: *Inventions, Technology innovation, Product development, Research projects, Recommendations, *Department of Energy, National Institute of Standards and Technology, Patent status.

The document contains a brief description of the Energy Related Inventions Program and recommended inventions 351 through 602 by the National Institute of Standards and Technology (NIST) to the Department of Energy since the inception of the program, including a brief summary of the current status of each.

00,374
PB94-111903 PC A09/MF A03
National Inst. of Standards and Technology (TS), Gaithersburg, MD. Office of Technology Evaluation and Assessment.
Energy Related Inventions Program. Status Report for Recommendations 1 through 350.
Jun 93, 193p, NISTIR-5260.
Supersedes PB92-226265. See also Recommendations 351 through 602, PB94-111853. Sponsored by Department of Energy, Washington, DC. Inventions and Innovation Div.

Keywords: *Inventions, Technology innovation, Product development, Research projects, Recommendations, *Department of Energy, National Institute of Standards and Technology, Patent status.

The document contains a brief description of the Energy Related Inventions Program and recommended inventions 1 through 350 by the National Institute of Standards and Technology (NIST) to the Department of Energy since the inception of the program, including a brief summary of the current status of each.

Electric Power Transmission

00,375
PB94-112182 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Research for Electric Energy Systems: An Annual Report, October 1993.
W. E. Anderson. Oct 93, 45p, NISTIR-5268.
See also PB93-118131. Sponsored by Department of Energy, Washington, DC. Div. of Electric Energy Systems.

Keywords: *Magnetic measurement, *Magnetic probes, *Electrical insulation, *Electric discharges, Dielectric breakdown, Breakdown(Electronic threshold), Electric corona, Magnetic fields, Sulfur hexafluoride, Sulfur fluorides, Radiation effects, Cross sections,

Negative Ions, Computerized simulation, Monte Carlo method, Power lines, Progress report, *Gaseous dielectrics, Dissociative electron attachment, NIST fields project, Partial discharges.

The report documents the technical progress of two investigations. The first investigation is concerned with the measurement of magnetic fields in support of epidemiological and in vitro studies of biological field effects. During 1992, the derivation of equations which predict differences between the average magnetic flux density using circular coil probes and the flux density at the center of the probe, assuming a dipole magnetic field, were completed. The information gained using these equations allows the determination of measurement uncertainty due to probe size when magnetic fields from many electrical appliances are characterized. Consultations with various state and federal organizations and the development of standards related to electric and magnetic field measurements continue. The second investigation is concerned with two different activities related to compressed-gas insulated high voltage systems: (1) the measurement of dissociative electron attachment cross sections and negative ion production in S2F10, S2OF10, and S2O2F10, and (2) Monte-Carlo simulations of ac-generated partial-discharge pulses that can occur in SF6-insulated power systems and can be sources of gas decomposition.

Energy Use, Supply, & Demand

00,376
PB93-183770 PC A09/MF A02
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Envelope Design Guidelines for Federal Office Buildings: Thermal Integrity and Airtightness.
A. K. Persily. Mar 93, 185p, NISTIR-4821.
See also PB91-112839. Sponsored by Public Buildings Service, Washington, DC. Office of Real Property Development.

Keywords: *Office buildings, *Air tightness, *Energy conservation, *Government buildings, *Design standards, Thermal insulation, Leakage, Air infiltration, Guidelines, Energy efficiency, Construction materials, Design criteria, Moisture content, *Office building envelopes.

Office building envelopes are generally successful in meeting a range of structural, aesthetic and thermal requirements. However, poor thermal envelope performance does occur due to the existence of defects in the envelope insulation, air barrier and vapor retarder systems. These defects result from designs that do not adequately account for heat, air and moisture transmission, with many being associated with inappropriate or inadequate detailing of the connections of envelope components. Other defects result from designs that appear adequate but can not be constructed in the field or will not maintain adequate performance over time. Despite the existence of these thermal envelope performance problems, information is available to design and construct envelopes that do perform well. In order to bridge the gap between available knowledge and current practice, NIST has developed thermal envelope design guidelines for federal office buildings for the General Services Administration. The goal of this project is to transfer the knowledge on thermal envelope design and performance from the building research, design and construction communities into a form that will be used by building design professionals. These guidelines are organized by envelope construction system and contain practical information on the avoidance of thermal performance problems such as thermal bridging, insulation system defects, moisture migration, and envelope air leakage.

Fuel Conversion Processes

00,377
PB93-145779 PC A04/MF A01
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Assessment of Fossil Energy Materials Research Needs.
S. J. Dapkunas, and G. Sorell. Oct 92, 67p, NISTIR-4992, ORNL/SUB-89-21857/01.
Contract DE-AC05-84OR21400
Prepared in cooperation with Sorell (G.) Consulting Services, North Caldwell, NJ. Sponsored by Oak Ridge National Lab., TN., Department of Energy, Washington, DC., and Martin Marietta Energy Systems, Inc., Oak Ridge, TN.

Keywords: *Energy technology, *Technology assessment, *Composite materials, *Ceramics, *Catalysts, *Coal gasification, Corrosion, Technology transfer, Process control, Electrolytes, Coatings, Thin films, Corrosion prevention, Coal liquefaction, Exhaust gases, Reviews, Heat engines, Austenitic steels, Combustion.

An assessment was conducted to identify the needs and opportunities in materials research directed at applying new developments in materials science and engineering to fossil energy technologies. The assessment was conducted through literature review and discussions with knowledgeable industrial, academic and governmental personnel. Topics worthy of research which will provide significant benefits to fossil technologies include the following: austenitic alloys, iron aluminides, ceramic filter materials, ceramic membranes, solid electrolytes, catalyst supports, protective coatings, erosion/abrasion/wear research, corrosion mechanism research, intelligent materials processing, diamond films, nanocomposites, superplastic forming of ceramics, surface active dual function materials and ceramic matrix components.

Fuels

00,378
DE93007992 PC A03/MF A01
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD.
Observations of soot in combustion of methanol/toluene spray flames.
C. T. Avedisian, C. Presser, A. K. Gupta, and H. G. Semerjian. 1992, 26p, CONF-921110-48.
Contract AI01-86CE90213
Winter annual meeting of the American Society of Mechanical Engineers (ASME), Anaheim, CA (United States), 8-13 Nov 1992. Sponsored by Department of Energy, Washington, DC.

Keywords: *Methanol, *Soot, *Toluene, Combustion, Flames, Lasers, Light Scattering, Mixtures, Petroleum Products, Quantity Ratio, Sprays, Synthesis, *Combustion products, EDB/025000.

The influence of composition on soot formation in spray flames was investigated using, a light scattering/dissymmetry ratio technique to provide information on soot mean size and concentration. The study was carried out using binary mixtures of a sooting (i.e., toluene) and nonsooting (i.e., methanol) liquid. The range of mixtures included methanol volume fractions, (alpha), of 0 (i.e., pure toluene), 0.25, 0.50, 0.75, 0.85, 0.90, 0.95, 0.99, and 1.0 (pure methanol). The flames were generated with an air-assist atomizer under the same operating conditions to isolate the effect of liquid composition.

00,379
PB93-159457 PC A04/MF A01
National Inst. of Standards and Technology (CSTL), Boulder, CO. Chemical Engineering Div.
Flow Conditioner Location Effects in Orifice Flowmeters.
Technical note.
J. L. Scott, C. F. Sindt, and M. A. Lewis. Jan 93, 72p, NIST/TN-1356.
Also available from Supt. of Docs. as SN003-003-03198-4. See also PB92-189521 and PB92-183730.

Keywords: *Orifice meters, *Flow distortion, *Position(Location), *Flowmeters, *Gas flow, Orifices, Reynolds number, Flow measurement, Discharge coefficient, Piping systems, Experimental data, Gas distribution, Pipe flow, Orifice flow.

Tests sponsored by Gas Research Institute were conducted with orifice flowmeters of two nominal sizes: 104 mm (4 in) and 52 mm (2 in). For the 104 mm orifice meter the authors compared discharge coefficients measured in two common piping configurations used by laboratories to establish baseline flow conditions. The discharge coefficients are similar for beta ratios of 0.43, 0.55, and 0.67, but not for the 0.73 beta ratio plate. For other tests with the orifice meter, a 90 degree elbow or a reducer was located upstream of the orifice plate and flow conditioner. Two beta ratios (0.54, 0.67) were tested in the 52 mm orifice meter in baseline configuration and with an elbow at 17D and a flow conditioner at 12D. For many of the tests, differential pressures were measured at more than one flange tap location. Placing the flow conditioner too close to the orifice plate in either meter yields discharge coefficients below baseline values. The location of the flow conditioner with respect to the orifice plate appears to influence meter performance more significantly than the type or location of flow disturbance upstream of it.

00,380
PB93-200822 PC A05/MF A02
National Inst. of Standards and Technology (CSTL), Boulder, CO. Thermophysics Div.
Speed of Sound Data and Related Models for Mixtures of Natural Gas Constituents.
B. A. Younglove, N. V. Frederick, and R. D. McCarty. Jan 93, 99p, NIST/MONO-178.
Also available from Supt. of Docs. as SN003-003-03201-8. Sponsored by Gas Research Inst., Chicago, IL. Physical Sciences Dept.

Keywords: *Natural gas, *Binary mixtures, *Flow measurement, *Sonic nozzles, Carbon dioxide, Methane, Ethane, Nitrogen, Propane, Mass flow, Sound waves, Transferring, Isotherms.

Sound speed data have been obtained for thirteen binary mixtures and four multicomponent mixtures of natural gas components using a cylindrical cavity. These data cover a temperature range from 250 to 350 K at pressures to 10 MPa. The uncertainty in the data is approximately 0.05 percent. The binary mixtures are primarily methane-rich, with ethane nitrogen, carbon dioxide, or propane as the second component. The multicomponent mixtures are representative of commercially available compositions in the United States and Europe. The data were used to develop and test mathematical models for prediction of the sound speed of natural gas mixtures, within an average uncertainty of 0.1 percent, over the ranges of pressure, temperature, and composition that encompass the major region of custody transfer for natural gas.

00,381
PB93-207470 PC A03/MF A01
National Inst. of Standards and Technology (CSTL), Boulder, CO. Thermophysics Div.
Thermophysical Properties of Fluids for the Gas Industry. Annual Report, January-December 1992.
T. J. Bruno, and W. M. Haynes. May 93, 19p, GRI-93/0098.
Contract GRI-5088-260-1700
See also PB88-216809 and PB88-250584. Sponsored by Gas Research Inst., Chicago, IL.

Keywords: *Fluids, *Thermophysical properties, *Natural gas, Gas industry, Equations of state, Experimental design, Mathematical models, Hydrocarbons, Thermophysical properties, Detectors, Halohydrocarbons, Natural gas liquids, Pipelines, Solubility.

The U.S. gas industry standard for computing thermophysical properties is the A.G.A. Transmission Measurement Committee Report No. 8 equation of state (AGA 8). The report summarized the results from several experimental, theoretical, and modeling programs directed at the extensive evaluation of the accuracy with which various types of natural gas physical properties can be calculated using AGA 8 and related methods. The most important results were the assembly of benchmark data sets for speed of sound, viscosity, fugacity, heat capacity, critical region PVT, mixture compressibilities, and vapor pressure measurements for natural gas fluids. When tested against these benchmark properties data, the AGA 8 equation of state model was found to be generally accurate within + or - 0.1% for sound speeds (and densities) and within + or - 0.03% for compressibilities over the ranges of pressure, temperature, and composition that encompass the major region of custody transfer for natural gas. Work was also completed on the fabrication and testing of a prototype catalytic cracking detector for the selective detection of hydrocarbons; a U.S. patent was awarded for this invention with the assignment to GRI.

Heating & Cooling Systems

00,382
PB93-228203 PC A04/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Building Environment Div.
Field Monitoring of a Variable-Speed Integrated Heat Pump/Water Heating Appliance.
A. H. Fanney. Jun 93, 64p, NIST/BSS-171.
Also available from Supt. of Docs. Sponsored by Allegheny Power System, Greensburg, PA.

Keywords: *Space HVAC systems, *Heat pumps, Houses, Energy consumption, Heating loads, Field tests, Computerized simulation.

The report describes the residence, heat pump system, and monitoring equipment. Results are presented which include comparison of the total electrical energy consumption of the residence prior to and after installation of the heat pump system, the portion of energy used by each end use within the residence, a comparison of the heat pump's energy consumption using a conventional watthour meter and an electronic digital power analyzer, and the hourly electrical demands imposed on the utility. The thermal performance of the heat pump system is reported on a monthly, seasonal, and annual basis using conventional performance indicators in addition to using an index, proposed by NIST, which quantifies the overall system performance of integrated appliances.

Policies, Regulations & Studies

00,383
PB93-198984 PC A11/MF A03
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Office of Applied Economics.
Life-Cycle Costing Workshop for Energy Conservation in Buildings: Student Manual.
Final rept.
S. K. Fuller, and S. R. Petersen. May 93, 232p, NISTIR-5165.
See also PB90-147968, PB92-238633 and PB93-120772. Sponsored by Department of Energy, Washington, DC. Federal Energy Management Program Staff.

Keywords: *Life cycle costs, *Energy conservation, *Federal buildings, Risk, Cost analysis, Economic analysis, Instructions, Education, Students.

The manual is intended as both an in-class workbook and as a future source for references and review. The course is designed for both public and private sector energy managers. Its purpose is to provide an overview of the life-cycle cost method, specific requirements for federal building applications, sources of data, and computer tools which can greatly simplify the analytical requirements of a life-cycle cost analysis. The life-cycle cost method and related measures of economic performance are presented in a traditional engineering-economics context.

00,384
PB93-228658 PC A03/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Office of Applied Economics.
ERATES: A Computer Program for Calculating Time-of-Use, Block, and Demand Charges for Electricity Usage (Version 1.0). User's Guide and Reference Manual.
S. R. Petersen. Jul 93, 40p, NISTIR-5186.
Sponsored by Federal Energy Management Program, Washington, DC.

Keywords: *Energy accounting, *Buildings, *Computer applications, Facilities, Life cycle costs, Electric power demand, Rates(Costs), Energy consumption, Cost effectiveness, Energy conservation, Interactive systems, User manuals(Computer programs), *ERATES computer program.

ERATES (Electricity Rates) is a computer program for calculating monthly and annual electricity costs for a facility, building, or system under a variety of electric utility rate schedules. Both kWh usage and maximum kW demand charges can be included in these costs. Most typically these calculations will be used to support engineering-economic studies which assess the cost-effectiveness of energy conservation measures or measures to shift electricity use from on-peak to off-peak time periods. With ERATES a user can set up time-of-use-rate schedules, block-rate schedules, and demand-rate schedules and save these schedules to a disk file. The user can then compute monthly and annual electricity costs with ERATES, given hourly or monthly kWh and kW demand data for a facility, building, or system. ERATES is a menu-driven, interactive program, designed to be run on an IBM-PC or compatible microcomputer under DOS version 3.0 or higher, with or without a hard disk. ERATES block-rate and demand-rate schedules can be imported by the NIST BLCC 4.0 computer program for use in computing the life-cycle cost of buildings and building systems. ERATES is not intended for use by utilities in setting up or administering electric rate schedules.

00,385
PB94-500097 CP D02
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Office of Applied Economics.
Computer Program for Calculating Time-of-Use, Block, and Demand Charges for Electricity Usage (ERATES), (Version 1.0) (for Microcomputers).
Software.
1993, diskette, NIST/SW/DK-93/007.
System: IBM PC or compatible; DOS version 3.0 or greater operating system. Open READ.ME file for installation instructions. See also PB94-500055 (BLCC). The software is on one 3 1/2 inch diskette, 1.44M high density. Documentation included; may be ordered separately as PB93-228658.

Keywords: *Software, *Facilities, *Electric power generation, *Costs, Rates(Costs), Electric utilities, Buildings, Energy demand, Energy consumption, Energy conservation, Life cycle costs, Diskettes.

ERATES (Electricity Rates) is a computer program for calculating monthly and annual electricity costs for a facility, building, or system under a variety of electric utility rate schedules. Both kWh usage and maximum kW demand charges can be included in these costs. Most typically these calculations will be used to support engineering-economic studies which assess the cost-effectiveness of energy conservation measures or measures to shift electricity use from on-peak to off-peak time periods. With ERATES a user can set up time-of-use-rate schedules, block-rate schedules, and demand-rate schedules and save these schedules to a disk file. The user can then compute monthly and annual electricity costs with the program, given hourly or monthly kWh usage and kW demand data for a facility, building, or system. ERATES block-rate and demand-rate schedules can be imported by the NIST BLCC (PB94-500055) computer program for use in computing the life-cycle cost of buildings and building systems. ERATES is not intended for use by utilities in setting up or administering electric rate schedules.

Solar Energy

00,386
DE93018005 PC A03/MF A01
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Chemical Kinetics Div.
Pulse Radiolytic Studies of Electron Transfer Processes and Applications to Solar Photochemistry. Progress Report, (February 1989--April 1990).
P. Neta. 20 Apr 90, 14p, DOE/ER/13108-T6.
Contract AI05-83ER13108
Sponsored by Department of Energy, Washington, DC.

Keywords: *Electron Transfer, Ascorbic Acid, Peroxy Radicals, Porphyrins, Chemical Reactions, Cobalt Complexes, Indium Complexes, Nickel Complexes, Organic Bromine Compounds, Organic Solvents, Oxidation, Phenols, Photosensitivity, Progress Report, Radicals, Radiolysis, Sensitizers, Solar Energy Conversion, *Photochemistry, EDB/140505.

Pulse radiolysis can provide absolute rate constants for reactions of many inorganic radicals and organic peroxyl radicals, key intermediates in many chemical processes. Emphasis of this work is electron transfer reactions of metalloporphyrins that may be applicable to solar energy conversion systems. Highlights of research during the past year are: metalloporphyrins and colloidal catalysts, peroxyl radicals, inorganic radicals, other topics.

00,387
DE93018016 PC A03/MF A01
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Chemical Kinetics and Thermodynamics Div.
Pulse Radiolytic Studies of Electron Transfer Processes and Applications to Solar Photochemistry. (Final) Progress Report, (February 1989--January 1992).
P. Neta. 17 Jan 92, 29p, DOE/ER/13108-T7.
Contract AI05-83ER13108
Sponsored by Department of Energy, Washington, DC.

Keywords: *Electron Transfer, Ascorbic Acid, Porphyrins, Anions, Cations, Chromium Complexes, Cobalt Complexes, Nickel Complexes, Organic Solvents, Oxidation, Peroxy Radicals, Photosensitivity, Progress Report, Radicals, Sensitizers, Solar Energy Conversion, *Photochemistry, EDB/140505.

The studies use pulse radiolysis to provide absolute rate constants for reactions of many inorganic radicals and organic peroxyl radicals, key intermediates in many chemical processes, and to study electron transfer reactions of metalloporphyrins for solar energy conversion. Highlights of research during the past 3 years are: metalloporphyrins and colloidal catalysts, inorganic radicals, peroxyl radicals, and other topics.

00,388
DE93018715 PC A03/MF A01
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Chemical Kinetics and Thermodynamics Div.
Pulse Radiolytic Studies of Electron Transfer Processes and Applications to Solar Photochemistry. Progress Report, (March 1992--March 1993).
P. Neta. 1 Apr 93, 22p, DOE/ER/13108-T8.
Contract AI05-83ER13108
Sponsored by Department of Energy, Washington, DC.

Keywords: *Porphyrins, *Pulsed Irradiation, *Solar Energy Conversion, Electron Transfer, Organic Solvents, Peroxy Radicals, Progress Report, Radicals, Radiolysis, Reaction Intermediates, EDB/140505.

Electron transfer and other reactions of various short-lived intermediates have been studied by pulse radiolysis and laser flash photolysis. Highlights of results during the past year are summarized under two main sections: Metalloporphyrin electron transfer and associated reactions, and solvent effects on reactions of inorganic radicals and organic peroxyl radicals.

ENVIRONMENTAL POLLUTION & CONTROL

Air Pollution & Control

00,389
PB93-198844 PC A07/MF A02
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Building and HVAC Characterization for Commercial Building Indoor Air Quality Investigations.
A. K. Persily. May 93, 142p, NISTIR-4979.
Sponsored by Environmental Protection Agency, Washington, DC. Office of Air and Radiation, and Department of Energy, Washington, DC. Building Systems and Materials Div.

Keywords: *Indoor air pollution, *Commercial buildings, *Space HVAC systems, Office buildings, Ventilation, Investigations, Questionnaires, Air quality.

A series of parameters have been developed to describe building and HVAC characteristics of commercial buildings in conjunction with indoor air quality investigations lasting one week or less. The building characterization includes both general information on the building as well as more specific information on the space being investigated. The space will in general be

only a portion of the building, but it could be the entire building. The parameters include those features deemed essential to an investigation intended to obtain baseline information on a test space within a building as opposed to a detailed research study or an effort to diagnose a specific problem. The report consists of checklists or forms for recording information on the building and HVAC parameters, along with instructions for completing the checklists. The checklists are divided in four areas: (A) Whole Building Description, (B) Test Space Description, (C) HVAC System Description, and (D) HVAC System Performance.

00,390
PB93-219764 PC A04/MF A01
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Surface and Microanalysis Science Div.
Handbook for Evaluation of TEM Sample Preparation of Particles on Membrane Filters: Version 1.0.
S. Turner, E. B. Steel, and J. M. Phelps. Jul 93, 53p, NISTIR-5134.
Sponsored by Environmental Protection Agency, Washington, DC.

Keywords: *Sample preparation, *Transmission electron microscopy, *Air pollution sampling, *Asbestos, Handbooks, Membranes, Air pollution detection, Chemical analysis, Performance evaluation, Comparison, Filters.

A necessary step for the analysis of air-collected asbestos by transmission electron microscopy (TEM) is the preparation of a thin, carbon film containing the asbestos particles. The carbon film is obtained by preparing a replica of the filter onto which the particles are collected. An ideal carbon replica is thin, clear and coherent, so that unhindered detection and analysis of any particles are possible. Round robin studies of replicas have shown that a variety of problems and artifacts can occur on replica preparations. The main purposes of this handbook are to: (1) describe and define the problems and artifacts found in sample preparation, (2) provide examples of area estimates of the coverage of the problems, (3) provide a procedure for analysis of replica preparations by light microscopy and TEM, and (4) provide a classification or nomenclature system so that interlaboratory comparisons may be performed.

00,391
PB93-221851 PC A02/MF A01
Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
Source Apportionment of Fine Particle Organics and Mutagenicity in Wintertime Roanoke.
Symposium paper.
C. W. Lewis, R. B. Zweidinger, L. D. Claxton, D. B. Klinedinst, and S. H. Warren. 17 Jun 93, 8p, EPA/600/A-93/167.
Presented at the Air and Waste Management Association/Environmental Protection Agency International Symposium, 'Measurement of Toxic and Related Air Pollutants', Durham, NC., May 3-7, 1993. See also PB91-219162. Prepared in cooperation with National Inst. of Standards and Technology, Gaithersburg, MD.

Keywords: *Indoor air pollution, *Air pollution sampling, *Residential buildings, Tracer studies, Mobile pollutant sources, Metals, Carbon 14, Smoke, Organic materials, Winter, Mutagenicity, Reprints, Roanoke(Virginia), Extractable organic matter, IACP(Integrated Air Cancer Project), Volatile organic compounds.

The U.S. Environmental Protection Agency has conducted a series of wintertime field studies in U.S. cities to measure ambient concentrations of fine particle EOM and associated mutagenicity. Receptor modeling has been employed with these measurements to determine the quantitative contributions of various emissions sources to both Extractable Organic Matter (EOM) and mutagenicity. The present work gives receptor modeling results for the 1988-1989 field study in Roanoke VA, an airshed whose principal sources of ambient EOM were anticipated to be woodsmoke, mobile sources and residential distillate oil combustion (RDOC).

00,392
PB93-236511 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Method for Separating Volatile Organic Carbon from 0.1 (sup 3) of Air to Identify Sources of Ozone Precursors via Isotope (14C) Measurements.
Symposium paper.
G. A. Klouda, J. E. Norris, L. A. Currie, G. C. Rhoderick, and R. L. Sams. 1993, 21p, EPA/600/A-93/222.
Pub. in Proceedings of the AWMA/EPA Symposium, 'Measurement of Air Toxic and Related Air Pollutants', Durham, NC., May 3-7, 1993. See also PB86-120664. Sponsored by Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.

Keywords: *Volatile organic compounds, *Ozone, *Precursors, *Air pollution, *Separation, Cryogenics, Air sampling, Oxidation, Mass spectroscopy, Carbon 12, Carbon 14, Hydrocarbons, Reprints.

Atmospheric non-methane volatile organic compounds (VOCs) are known to play an important role in urban ozone formation during the summer. To respond to the need for a direct measure of VOC source contributions from biogenic ((14)C/(12)C=10 to the -12 power) and fossil fuel ((14)C/(12)C=0) emissions, a system and protocol are being developed to separate the total VOC fraction from 0.1 cu m of ambient air for accelerator mass spectrometry (AMS) (14)C. The gas separation system developed at NIST allows for the simultaneous separation of low vapor pressure (LVP) VOCs and H2O, high vapor pressure (HVP) VOCs and CO2, CO and CH4 through sequential cryogenic separation and selective oxidation techniques. Preliminary results of this system and procedure for isolating these fractions show a LVP-VOC blank of 2 + or - microgram C, which represents the effect of the separation system plus CO2 cross-contamination. Hydrocarbons having vapor pressures greater than n-decane are not retained at a level of more than a few percent in the LVP-VOC fraction. The recovery of C5-C8 hydrocarbons in the combined HVP-VOC and CO2 fraction ranges from 27% to 78%.

00,393
PB94-114519 PC A04/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Fire Safety Engineering Div.
Smoke Plume Trajectory from In situ Burning of Crude Oil in Alaska.
K. B. McGrattan, A. D. Putorti, W. H. Twilley, and D. D. Evans. Oct 93, 72p, NISTIR-5273.
Sponsored by Alaska State Dept. of Environmental Conservation, Anchorage.

Keywords: *Oil spills, *Crude oil, *Combustion, *Smoke, *Dispersing, Fire tests, Burning rate, Plumes, Alaska.

Experimentation, analysis, and modeling have been performed to predict the downwind dispersion of smoke resulting from in situ burning of oil spills. North Slope and Cook Inlet crude oils are burned on water in a 1.2 meter diameter pan. Burning rates and smoke aerosol size distributions are also measured, and found similar to previous work with different crude oils. Derivation of scaling factors for predicting the burning rates and smoke yields are large scale fires are guided by previous experiments with Louisiana crude oil. Scaled burning rates and smoke yields are supplied as input parameters for the LES (Large Eddy Simulation) model, version 2.0, of windblown smoke transport over flat terrain. For weather conditions appropriate for the Cook Inlet and North Slope areas, model results are presented which predict downwind dispersion and ground level concentrations of the fire generated particulate matter.

Radiation Pollution & Control

00,394
PB93-162972 PC A04/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Site Exploration for Radon Source Potential.
F. Y. Yokel, and A. B. Tanner. Dec 92, 75p, NISTIR-5135.
Sponsored by Department of Housing and Urban Development, Washington, DC.

Keywords: *Radon, *Site surveys, *Buildings, *Soil surveys, Radiation measurement, Pollution sources, Soil gases, Environmental surveys, Extraction, Diffusion, Porosity, Permeability, Construction.

Elevated radon in buildings has been recognized as a serious potential public health hazard and indoor radon mitigation has been legislated (EPA, 1992(1), Public Law 100-551, 1988). Substantial research efforts have been devoted to epidemiological studies to assess the effects of radon exposure, indoor radon surveys in various areas in the U.S., study of radon transport mechanisms, and geological mapping (for instance DOE, 1992). The purpose of the report is to propose exploration and test methods for the characterization of the radon source potential of individual building sites and fill materials.

Water Pollution & Control

00,395
PB93-166627 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Organic Analytical Research Div.
Standard Reference Materials for Trace Organic Contaminants in the Marine Environment.
Final rept.
S. Wise, M. Schantz, R. Parris, T. Gills, R. Rebbert, and B. Benner. 1992, 5p.
Sponsored by National Oceanic and Atmospheric Administration, Washington, DC.
Pub. in Analusis Magazine 20, n6 p57-61 1992.

Keywords: *Organic compounds, *Chemical analysis, *Marine environments, *Water pollution detection, Marine animals, Pesticides, Aromatic polycyclic hydrocarbons, Polychlorinated biphenyls, Chlorine organic compounds, Sediments, Water pollution effects, Reprints, *Standard reference materials.

Recently NIST has issued standard reference materials (SRMs) for the determination of organic contaminants in the marine environment such as aliphatic hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and chlorinated pesticides. Both calibration solutions and natural mixture/matrix SRMs have been developed including sediment, mussel tissue and whale blubber matrices. The purpose of the article is to describe briefly the SRMs available that will be of interest to scientists involved in the analysis of marine samples.

00,396
PB94-101839 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
In situ Burning of Oil Spills: Mesoscale Experiments and Analysis.
W. D. Walton, D. D. Evans, K. B. McGrattan, H. R. Baum, and W. H. Twilley. Sep 93, 40p, NISTIR-5192.
Sponsored by Minerals Management Service, Herndon, VA.

Keywords: *Oil spills, *Fire tests, *Burning rate, Crude oil, Smoke, Plumes, Water.

A series of six mesoscale and one large laboratory fire experiments were performed to measure the burning characteristics of Louisiana crude oil on water in a pan. These included one - 6 m square and five 15 m square mesoscale burns and one - 1.2 m diameter laboratory burn. Results of the measurements for burning rate and smoke emissions are compared to those from previous burns of various scales. Predictions of smoke plume trajectory and particulate deposition at ground level from the Large Eddy Simulation (LES) model developed as part of the research effort are presented. LES is a steady-state three-dimensional calculation of smoke plume trajectory and smoke particulate deposition based on a mixed finite difference and Lagrangian particle tracking method.

HEALTH CARE

Environmental & Occupational Factors

00,397
PB93-220820 PC A07/MF A02
George Mason Univ., Fairfax, VA.
Guide to Board and Care Fire Safety Requirements in the 1991 Edition of the Life Safety Code.
N. E. Groner. Jul 93, 150p, NIST/GCR-93/629.
Grant 60NANB9D0974
See also PB92-205483. Sponsored by National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.

Keywords: *Fire safety, *Nursing homes, Standards, Building codes, Handicaps, Cost analysis, Sprinkler systems, Evacuating(Transportation), Residential buildings, Fire safety.

The guide was written as part of a larger project with the overall goal of promoting a high degree of fire safety in board and care homes without unnecessary expense or interference with the program objectives of the homes. The guide is an accessory to the Life Safety Code, not a substitute. There are certain requirements that can be reasonably interpreted in ways that differ from the descriptions offered in the guide. The reader is cautioned to read the exact wording of the Code and reach his or her own conclusions. To this end, section numbers in the 1991 edition of the Code are referenced throughout the guide.

INDUSTRIAL & MECHANICAL ENGINEERING

Industrial Safety Engineering

00,398
PB93-234722 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Air Moving Systems and Fire Protection.
J. H. Klote. Jul 93, 19p, NISTIR-5227.

Keywords: *Space HVAC systems, *Fire hazards, Air conditioning, Fire protection, Smoke abatement, Stairways, Air flow, Dilution, Pressurizing, Buoyancy.

The fire hazards associated with heating, ventilating, and air conditioning (HVAC) systems are significant. Protection is needed from the spread of fire and smoke due to both fires starting inside an HVAC system and fires starting outside an HVAC system. Materials for HVAC components are restricted, and fire dampers and smoke dampers are needed. To provide smoke protection, an HVAC system can be shut down or it can be put into a special smoke control mode of operation. Smoke from building fires can be managed by the mechanisms of compartmentation, dilution, air flow, pressurization, and buoyancy.

Laboratory & Test Facility Design & Operation

00,399
PB93-125672 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Chemical Kinetics Div.
Precision and Accuracy in XQQ Measurements: A Summary Report of the NIST-EPA International Round Robin.
Final rept.
R. I. Martinez. 1989, 3p.
Pub. in Rapid Commun. Mass Spectrom. 3, n5 p127-129 1989.

Keywords: *Precision, *Accuracy, Computer aided design, Data bases, Standardization, Reprints, *XQQ instruments, National Institute of Standards and Technology, Environmental Protection Agency.

The paper describes the kinetics-based measurement protocol which was used for the National Institute of Standards and Technology (NIST)-Environmental Protection Agency (EPA) International Round Robin, and provides an interim summary report of the results. At least 50% of the XQQ instruments currently in the field potentially can provide a dynamically-correct (i.e., instrument-independent) representation of ion-molecule reactions.

00,400
PB93-125680 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Chemical Kinetics Div.
Instrument-Independent Database for Collisionally Activated Dissociation in Radiofrequency Only Quadrupoles. Single-Collision Versus Multiple-Collision Conditions.
Final rept.
R. I. Martinez, and B. Ganguli. 1989, 5p.
Pub. in Rapid Commun. Mass Spectrom. 3, n12 p427-431 1989.

Keywords: *Mass spectrometers, *Computer aided design, *Particle collisions, Cations, Acetone, Data bases, Quadrupole moment, Reprints, XQQ instruments.

Dynamically-correct (i.e., instrument-independent) computer aided design (CAD) spectra can be measured in XQQ (QQQ, BEQQ, etc.) tandem mass spectrometers under single-collision conditions. Hence, the characteristic branching ratios of ionic substructures can be used for the development of an instrument-independent CAD database. By contrast, while multiple-collision conditions can provide much more extensive fragmentation, they do distort the primary dynamical information that is specific to a particular ionic substructure.

00,401
PB93-146645 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Precision Engineering Div.
NIST Length Scale Interferometer Measurement Assurance.
J. S. Beers, and W. B. Penzes. Dec 92, 32p, NISTIR-4998.

Keywords: *Dimensional measurement, *Length, Error analysis, Interferometry, Uncertainty, Precision, Accuracy.

The paper is an extension of NBSIR 87-3625, Length Scale Measurement Procedures at the National Bureau of Standards. Results from the measurement assurance program (MAP) for graduated length scales over a twenty six year period are reviewed. Line scale interferometer modifications, measurement procedure changes, computational revisions, and a re-evaluation of measurement errors are described and their effects discussed. The question of whether the observed length changes in the MAP control standards are apparent or real is resolved. Improvements in precision and accuracy are demonstrated.

00,402
PB93-156644 PC A08/MF A02
National Inst. of Standards and Technology (TS), Gaithersburg, MD. National Voluntary Lab. Accreditation Program.
National Voluntary Laboratory Accreditation Program 1993 Directory.
Special pub.
V. R. White. Jan 93, 171p, NIST/SP-810-ED-1993.
Also available from Supt. of Docs. as SN003-003-03191-7. Supersedes report for 1992, PB92-201094.

Keywords: *Laboratories, *Directories, Acoustic measurement, Asbestos, Carpets, Computer applications, Construction materials, Electromagnetic compatibility, Thermal Insulation, Dosimetry, Telecommunication, Paints, Paper, Plastics, Seals(Stoppers), Sealers, *National Voluntary Laboratory Accreditation Program, NVLAP program.

The 1993 Directory provides a listing of laboratories accredited by the National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program (NVLAP). The names of approximately 800 laboratories in 11 laboratory accreditation programs (LAPs) are included. A brief description of the NVLAP program and a summary of laboratory participation are provided. As an aid to the user, indexes are cross-referenced by laboratory name, LAP, geographic location (state or country), and NVLAP Lab Code. A listing of the test methods (Scope of Accreditation) is provided for each laboratory.

00,403
PB93-159465 PC A03/MF A01
National Inst. of Standards and Technology (PL), Gaithersburg, MD.
Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurements Results.
Technical note. (Final).
B. N. Taylor, and C. E. Kuyatt. Jan 93, 20p, NIST/TN-1297.
Also available from Supt. of Docs. as SN003-003-03193-3.

Keywords: International agreements, Confidence level, Calibration, Standards, *Measurement uncertainty, Reference materials, US NIST.

The Technical Note presents, in the context of the new NIST policy on uncertainty statements, those aspects of the Guide to the Expression of Uncertainty in Measurement being developed internationally that will be of most use to the NIST staff in implementing that policy. (The Guide is expected to be published by the International Organization for Standardization (ISO) during the first half of 1993 in the name of the ISO and the six other international organizations that sponsored its development.) Also included are suggestions not contained in the Guide or policy. However, none of the guidance given in the Technical Note is to be interpreted as NIST policy unless it is directly quoted from the policy itself.

00,404
PB93-166684 Not available NTIS
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Automated Production Technology Div.
Automation of Strain-Gauge Load-Cell Force Calibration.
Final rept.
K. Yee. 1992, 5p.
See also PB92-187087.
Pub. in Proceedings of NCSL Workshop and Symp. Managing Worldwide Measurements, Washington, DC., August 2-6, 1992, p387-391.

Keywords: *Load cells, Computerized control systems, Strain gages, Static loads, Calibration, Automation, Reprints, Dead weight machines, US NIST.

The National Institute of Standards and Technology (NIST) has six dead-weight machines (DWMs), used for force calibrations up to 4.4 meganewtons (MN), which were all placed in service ca. 1965. More than 20 years later, five of these machines were automated. They now automatically apply programmed force values to the strain-gauge load cell and record the output using a high-precision digital voltmeter, all controlled by a PC-XT class computer. Subsequently, environmental chambers have been added to three machines to perform automatically the type evaluation testing of load cells used in scales in commerce.

00,405
PB93-196277 (Order as PB93-196228, PC A07/MF A02)
National Inst. of Standards and Technology, Gaithersburg, MD.
Drift Eliminating Designs for Non-Simultaneous Comparison Calibrations.
T. Doiron. 1993, 8p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n2 p217-224 Mar/Apr 93.

Keywords: *Instrument errors, *Calibrating, *Drift, Metrology, Comparison, Elimination, Gage blocks.

The effects of drift on calibrations carried out by comparison have been studied at the National Institute of Standards and Technology for many years, and a num-

ber of strategies have been introduced to combat these effects. One strategy, the use of comparison designs which are inherently immune to linear drift, was developed specifically for mass comparison measurements. These techniques, developed for simultaneous comparisons, are extended to the case of non-simultaneous comparisons, such as gage block calibrations, where each artifact is measured separately, and the comparison is made mathematically from the individual measurements.

00,406
PB93-209781 PC A16/MF A03
National Inst. of Standards and Technology, Gaithersburg, MD.
Report of the National Conference on Weights and Measures (77th). Held in Nashville, Tennessee on July 19-23, 1992.
Special pub.
C. S. Brickenkamp, and A. H. Turner. Oct 92, 373p, NIST-SP-845.
Also available from Supt. of Docs. Library of Congress catalog card no. 26-27766.

Keywords: *Meetings, *Weight measurement, *Standards, Metrology, US NIST, Tolerances(Mechanics), Measuring instruments, International relations, Regulations, Nashville(Tennessee).

The 77th Annual Meeting of the National Conference on Weights and Measures (NCWM) was held July 19 through 23, 1992, at the Stouffer Nashville Hotel in Nashville, Tennessee. The theme of the meeting was 'Partnerships for Progress.' Reports by the standing and annual committees of the Conference comprise the major portion of the publication, along with the addresses delivered by Conference officials and other authorities from government and industry. Special meetings included those of the Metrologists, the Associate Membership Committee, the Retired Officials Committee, the Scale Manufacturers' Association, the American Petroleum Institute, the Industry Committee on Packaging and Labeling, the regional weights and measures associations, and the National Association of State Departments of Agriculture Weights and Measures Division, and the National Council on State Metrication.

00,407
PB93-213106 PC A10/MF A03
National Inst. of Standards and Technology, Gaithersburg, MD.
NIST Handbook 44, 1993: Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices as Adopted by the 77th National Conference on Weights and Measures 1992.
H. V. Oppermann. Oct 92, 222p.
Supersedes PB92-155084. Also available from Supt. of Docs.

Keywords: *Weight measurement, *Tolerances(Mechanics), *Metrology, *Measuring instruments, *Standards, Liquid level indicators, Water meters, Weight indicators, Fuel tanks, Flowmeters, Vapors, Liquified petroleum gases, Grains(Food), Moisture meters.

Handbook 44 was first published in 1949, having been preceded by similar handbooks of various designations and in several forms beginning in 1918. The 1993 edition was developed by the Committee on Specifications and Tolerances of the National Conference on Weights and Measures with the assistance of the Office of Weights and Measures of the National Institute of Standards and Technology. It includes amendments adopted by the 77th annual meeting of the National Conference on Weights and Measures in 1992.

00,408
PB93-219715 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Precision Engineering Div.
Recent Results of the NIST National Ball Plate Round Robin.
G. Caskey, S. D. Phillips, and B. Borchardt. Jun 93, 14p, NISTIR-5218.

Keywords: *Metrology, *Industrial engineering, *Production engineering, *Precision, Calibrating, Balls, Metal plates, Measuring instruments, Computer techniques, Coordinates.

The impetus behind the national ball plate round robin, administrated by the National Institute of Standards and Technology (NIST) in cooperation with the National Conference of Standards Laboratories (NCSL) and the University of North Carolina at Charlotte (UNCC), was to provide a simple method for the assessment of the current state of industrial measurement capability using coordinate measuring machines (CMMs). The round robin participants included various US public and private manufacturing institutions that are engaged in coordinate metrology using coordinate measuring machines. In order to provide a fair comparison, only computer controlled coordinate measuring machines were included in the study. There were a total of 16 organizations that volunteered to participate in this round robin, representing a substantial portion of the manufacturing spectrum. Most participants are leaders in their fields, which include aerospace, heavy equipment, petroleum equipment and defense facilities.

00,409
PB93-219756 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Precision Engineering Div.
Development of a National Metrology Infrastructure for the Domestic Gear Industry.
D. C. Stieren. Jun 93, 15p, NISTIR-5215.

Keywords: *Gears, *Metrology, *Industrial engineering, Quality control, Standards, Design criteria, Aerospace industry, Automotive industry, Construction industry.

The domestic gear industry is large, shipping several billion dollars in products annually. Gears are omnipresent in our society and economy. Recently, the domestic gear industry has requested assistance from NIST to improve the quality control practices associated with the manufacture of precision gears. These requests have been formalized and documented at two industrial workshops, referenced in this text. As a result of these workshops and analysis of the industry, it can be concluded that several changes need to occur in the industry.

00,410
PB94-118288 PC A07/MF A02
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
NIST Building and Fire Research Laboratory. Projects 1993.
N. J. Raufaste. Aug 93, 132p, NIST/SP-838-1.
Also available from Supt. of Docs. as SN003-003-03233-6. See also PB94-110194 and PB94-113420.

Keywords: *Research laboratories, *US NIST, *Buildings, *Fire tests, Construction materials, Research management, Standards, Earthquake engineering, Structural engineering, Concretes, Tests, Coatings, Quality control, Space HVAC systems, Indoor air pollution, Fire safety, Smoke.

The report summarizes the Building and Fire Research Laboratory's research for 1993. The report is arranged by its research programs: structural engineering, materials engineering, mechanical and environmental systems, fire science and engineering, and fire measurement and research. Each summary lists the project title, point of contact, sponsor, research, and results. BFRL's mission is to increase the usefulness, safety, and economy of constructed facilities, and reduce the human and economic costs of unwanted fires in buildings.

LIBRARY & INFORMATION SCIENCES

Information Systems

00,411
PB94-101847 PC A08/MF A02
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Information Systems Engineering Div.
Towards SQL Database Langauge Extensions for Geographic Information Systems.
V. B. Robinson, and H. Tom. Aug 93, 154p, NISTIR-5258.
Prepared in cooperation with Erindale Coll., Mississauga (Ontario). Inst. for Land Information Management.

Keywords: *Geographic information systems, Query languages, Object-oriented programming, Data processing, Standards, *SQL(Structured Query Language), *Database languages.

Contents:
- On Heterogeneous Geographic Information Systems, Architectures, Spatial Data Models, Transactions and Database Languages;
- Database Language SQL:
- Emerging Features for GIS Applications;
- Proposed Spatial Data Handling Extensions to SQL;
- A Geographic Information Systems Perspective on Spatial and Object Oriented Extensions to SQL;
- Conceptual Folding and Unfolding of Spatial Data for Spatial Queries.

00,412
PB94-114568 PC A07/MF A02
National Inst. of Standards and Technology (TS), Gaithersburg, MD. Office of Information Services.
Databases Available in the Research Information Center of the National Institute of Standards and Technology.
Special pub.
D. Cunningham. Sep 93, 148p, NIST/SP-855.
Supersedes PB93-114478. Also available from Supt. of Docs. as SN003-003-03240-9.

Keywords: *Data bases, *Information services, Information systems, Indexes(Documentation), Subject indexing, Directories, Vendors, Tables(Data), US NIST.

Databases available online in the Research Information Center of the National Institute of Standards and Technology (NIST) are listed by acronym and by full title. In addition, descriptions of the databases, dates covered, producers, hard copy counterpart, principal sources and vendors are listed. A list of databases on CD-ROM is also included. A general subject index, a cross reference index, and a full text database list are also supplied.

Reference Materials

00,413
PB94-120847 PC A12/MF A03
National Inst. of Standards and Technology (TS), Gaithersburg, MD. Office of Information Services.
NIST Serial Holdings, 1993.
Special pub. (Final).
S. A. Sanders. Feb 93, 269p, NIST/SP-777-ED-1993.
Also available from Supt. of Docs. as SN003-003-03196-8. Supersedes PB92-190487.

Keywords: *Periodicals, *Catalogs(Documentation), *Collection, *Information centers, Standards, Libraries, Metrology, *National Institute of Standards and Technology, *NIST.

This publication contains bibliographic information on approximately 5,000 titles held in the National Institute of Standards and Technology (NIST) Research Information Center, representing current and noncurrent journals, periodicals, annuals, memoirs, proceedings and transactions.

MANUFACTURING TECHNOLOGY

Computer Aided Design (CAD)

00,414
AD-A261 193/7 PC A18/MF A04
National Bureau of Standards, Washington, DC. Inst. for Computer Sciences and Technology.
Collection of Technical Studies Completed for the Computer-Aided Acquisition and Logistic Support (CALS) Program Fiscal Year 1987. Volume 4.
Technical rept. Oct 86-Sep 87.
S. J. Kemmerer. Mar 88, 425p.

Keywords: *Software engineering, *Computer applications, *Logistics support, Acquisition, Computers, Data management, Department of Defense, Environments, Industries, Management, Policies, Raster, Standards, Computer aided design, Computer aided manufacturing, Information transfer, Integrated systems, *CALS(Computer Aided Acquisition and Logistics Support).

The overall objective of the Department of Defense Computer-aided Acquisition and Logistic Support (CALS) Program is to integrate the design, manufacturing, and logistic functions through the efficient application of computer technology. The National Bureau of Standards has been funded since Spring 1986 to recommend a suite of industry standards for system integration and digital data transfer, and to accelerate their implementation. A major FY87 thrust was the completion of initial documentation of the high-priority standards required in the CALS environment. This volume is one of four providing a collection of the final reports presented-to the CALS Policy Office. Major areas contained within this volume include: text, data management, media, raster compression, and conformance testing strategy. The other three volumes contain the graphics and product data reports.... CALS, Conformance, DoD, IRDS, Media, ODA/ODIF, Raster compression, SGML, SQL, Testing.

00,415
AD-A261 261/2 PC A20/MF A04
National Inst. of Standards and Technology, Gaithersburg, MD.
Collection of Technical Studies Completed for the Computer-Aided Acquisition and Logistic Support (CALS) Program Fiscal Year 1988. Volume 2. Graphics, CGM MIL SPEC.
Interim rept. Oct 87-Sep 88.
R. S. Morgan. Mar 91, 468p.

Keywords: *Computer aided design, *Computer aided manufacturing, Computers, Industries, Logistics, Standards, Strategy, Transitions, Weapon systems, Weapons, Data acquisition, Integrated systems, *CALS(Computer Aided Acquisition and Logistics Support), *CGM(Computer Graphics Metafile), Computer graphics.

Computer-aided Acquisition and Logistic Support (CALS) Program is a DoD industry strategy to transition from paper-intensive acquisition and logistic processes to a highly automated and integrated mode of operation for the weapon systems of the 1990s. These volumes document the accomplishments of the National Institute of Standards and Technology to advance the development of technology and standards in support of CALS. These reports are divided into three volumes: 1, Text, Security, and Data Management; 2, Graphics, CGM MIL-SPEC; and 3, Graphics, CGM Registration. Volume 2. Graphics: Progress in the Computer Graphics Metafile standard is described, including work in the graphics standards committees and the expansion and updating of the CALS CGM application profile. A draft Military Specifications for CGM is included. A plan for Extended CGM is presented, including documentation of relevant standards committee work.... CGM, Extended CGM, Graphics, Graphics metafile, Metafile.

00,416
AD-A270 049/0 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Initial Graphics Exchange Specification (IGES).
30 Nov 92, 11p, NIST-FIPS-PUB-177.

Keywords: *Computer graphics, *Information exchange, *Standards, *Computer aided design, *Computer aided manufacturing, Computer program verification, Digital computers, Specifications, Syntax, Computer files, Life cycle costs, IGES(Initial Graphics Exchange Specifications), FIPS(Federal Information Processing Standard), Cost Reduction.

This publication announces the adoption of American National Standard Digital Representation for Communication of Product Definition Data, ASME/ANSI Y14.26M-1989, as a Federal Information processing Standard (FIPS). ASME/ANSI Y14.26M-1989, more commonly known as the Initial Graphics Exchange Specification (IGES), specifies file structure and syntactical definition, and defines the representation of geometric, topological, and nongeometric product definition data. ASME/ANSI Y14.26M-1989 establishes information structures for the digital representation and communication of product definition data. Use of this standard permits the compatible exchange of product definition data used by various computer-aided design and computer-aided manufacturing (CAD/CAM) systems.

00,417
FIPS PUB 177 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Initial Graphics Exchange Specification (IGES). Category: Software Standard; Subcategory: Graphics and Information Interchange.
30 Nov 92, 12p.
Three ring vinyl binder also available; North American Continent price $7.00; all others write for quote.

Keywords: *Computer aided design, *Computer aided manufacturing, *Federal information processing standards, Product development, Digital data, Data transfer(Computers), Computer graphics, Computer software, *IGES(Initial Graphics Exchange Specification), API(Application Programmers Interface).

The publication announces the adoption of American National Standard Digital Representation for Communication of Product Definition Data, ASME/ANSI Y14.26M-1989, as a Federal Information Processing Standard (FIPS). ASME/ANSI Y14.26M-1989, more commonly known as the Initial Graphics Exchange Specification (IGES), specifies file structure and syntactical definition, and defines the representation of geometric, topological, and nongeometric product definition data. ASME/ANSI Y14.26M-1989 establishes information structures for the digital representation and communication of product definition data. Use of the standard permits the compatible exchange of product definition data used by various computer-aided design and computer-aided manufacturing (CAD/CAM) systems.

00,418
PB93-140820 PC A03/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Report on the Raster Capabilities of MIL-R-28002A and MIL-D-28003A.
L. S. Rosenthal. Nov 92, 26p, NISTIR-4970.
See also PB91-962301 and PB92-962401.

Keywords: *Military requirements, Specifications, Data systems, Automation, Computer graphics, Standards, *CALS, *Raster graphics, Computer-aided Acquisition and Logistics Support, CGM(Computer Graphics Metafile), Tiling, Department of Defense.

The report examines and compares the tiled raster graphics capabilities of military specifications MIL-R-28002A and MIL-D-28003A. It presents reasons for which specification, MIL-R-28002A or MIL-D-28003A, to use to represent raster data.

00,419
PB93-146454 PC A04/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Database Management Systems in Engineering.
K. C. Morris, M. Mitchell, C. Dabrowski, and E. Fong. Dec 92, 56p, NISTIR-4987.
Supersedes PB93-138964.

Keywords: *Engineering, *Data base management systems, Object-oriented programming, Software engineering, Data bases, Data structures, File organization, Memory(Computers), Concurrent processing, Standards.

Until recently the applicability of database technology to engineering systems has been limited. Early database systems addressed large-scale data processing needs of easily automatable applications. These applications were characterized by very uniform data and well understood processing methods. Engineering applications, on the other hand, are characterized by highly complex data with very variable structure. The need to represent engineering data has driven advances in database technology. Engineering domains also impose unique, new requirements on other aspects of database technology. In particular, to support the evolutionary nature of the engineering environment, recent developments in database technology have focused on the temporal dimensions of data management. In addition, the present trend in manufacturing towards concurrent engineering raises new considerations for the cooperative use of data in a distributed engineering environment. All of these factors are reflected in the new generation of database systems and are described in the article.

00,420
PB93-151165 Not available NTIS
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Information Systems Engineering Div.
CALS Testing: Programs, Status and Strategy.
Final rept.
S. J. Kemmerer. 1992, 7p.
See also PB93-125029.
Pub. in CALS Jnl., p55-61 1992.

Keywords: *Tests, Standards, Specifications, Reprints, *CALS, Computer-aided Acquisition and Logistics Support, Conformance testing, PDES(Product Data Exchange using STEP), STEP(Standard for the Exchange of Product Model Data).

The Computer-aided Acquisition and Logistics Support (CALS) Initiative from its inception, has viewed testing as an important aspect of qualifying the national and international standards as they are being developed, evaluating the viability of the CALS military specifications, and gaining credibility of those products which implement the military specifications. The purpose of the article is to: explain the various types of testing activities embodied in the CALS initiative as they are understood today; and provide a status update on conformance testing activities for those standards already adopted by CALS.

00,421
PB93-152171 PC A07/MF A02
National Inst. of Standards and Technology (CSL), Gaithersburg, MD.
Raster Graphics: A Tutorial and Implementation Guide.
F. E. Spielman, and L. H. Sharpe. Jan 93, 137p, NISTIR-5108.
Supersedes PB91-187708. See also PB92-119676, PB92-196070, PB93-962001 and PB93-962301. Sponsored by Assistant Secretary of Defense (Production and Logistics), Washington, DC. Computer-aided Acquisition and Logistic Support Program.

Keywords: *Standards, Computer graphics, Documents, File structures, Image processing, Data compression, Specifications, *CALS, *Raster graphics, Computer-aided Acquisition and Logistics Support, ODA(Open Document Architecture), ASN1(Abstract Syntax Notation One).

The report examines the technical issues facing an implementor of the raster data interchange format defined in the Open Document Architecture (ODA) Raster Document Application Profile (DAP). Information previously scattered throughout several standards is incorporated into the report for ease of reference. The ODA Raster DAP is analyzed with regard to both notation and intent.

00,422
PB93-153450 Not available NTIS
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Factory Automation Systems Div.
NIST EXPRESS Toolkit: Lessons Learned.
Final rept.
D. Libes, and S. Clark. 1992, 13p.
Pub. in Proceedings of EXPRESS Users' Group Conference, Dallas, TX., October 17-18, 1992, p1-13.

Computer Aided Design (CAD)

Keywords: *Software tools, Compilers, Computer aided design, Computer aided manufacturing, Standards, Reprints, *PDES(Product Data Exchange Using STEP), *EXPRESS programming language, STEP(Standard for the Exchange of Product Model Data), NIST(National Institute of Standards and Technology).

In 1990, the National Institute of Standards and Technology (NIST) released a software toolkit for building EXPRESS-related tools. The authors have redesigned the toolkit with respect to user experience and the EXPRESS Draft International Standard. The paper describes their work and the current state of the NIST EXPRESS toolkit. It also comments on: the 'hard' parts of implementing the EXPRESS language, things they did wrong, several implementation-dependent extensions to EXPRESS, and sophisticated error and warning detection. They revisit the original ideas underlying the toolkit concept. They discuss whether, in light of present experiences, the concepts still make sense, can be amended, or should be entirely scrapped.

00,423
PB93-158715 PC A07/MF A02
National Inst. of Standards and Technology, Gaithersburg, MD.
Proceedings of the AP Validation Workshop. Held in Seattle, Washington on April 13-14, 1992. National PDES Testbed Report Series.
M. Mitchell, and J. Parker. Jan 93, 130p, NISTIR-5107.
See also PB92-112374 and PB92-123090. Sponsored by CALS Evaluation and Integration Office, Washington, DC., and Department of Commerce, Washington, DC.

Keywords: *Meetings, Computer aided design, Computer aided manufacturing, Product development, Standards, Models, Quality assurance, Guidelines, Requirements, Navy, Tests, *CALS, *Application Protocols, Computer-aided Acquisition and Logistics Support, STEP(Standard for the Exchange of Product Model Data), PDES(Product Data Exchange using STEP).

Contents:
- Guidelines on Writing Standards within STEP;
- Status of AP Methods and Documentation;
- Model Quality Criteria and Metrics Status;
- Deploying the Voice of the Customer;
- What Information is Required in APs to Ensure Compatible Information Exchange;
- Common Methods for PDES, Inc;
- Developing and Validating Marine Industry Application Protocols;
- The Roles of Mapping Tables and Conformance Test Purposes In STEP Application Protocols.

00,424
PB93-178580 PC A04/MF A01
National Inst. of Standards and Technology (CSL), Gaithersburg, MD. Information Systems Engineering Div.
Detailed Design Specification for Conformance Testing of Computer Graphics Metafile (CGM) Interpreter Products.
Rept. for Oct 91-Oct 92.
D. R. Benigni. Mar 93, 57p, NISTIR-5146.
Sponsored by Assistant Secretary of Defense (Production and Logistics), Washington, DC. Computer Aided Acquisition and Logistic Support Office.

Keywords: *Computer program verification, Federal information processing standards, Tests, Specifications, Interpreters, Parsers, *CALS, *CGM(Computer Graphics Metafile).

In support of the Computer Aided Acquisition and Logistic Support (CALS) initiative, one of the National Institutes of Standards and Technology is (NIST's) major tasks has been to ensure that conformance testing of CALS standards, Including Computer Graphics Metafile (CGM), is available to meet CALS requirements. The report provides a detailed design specification and outlines the first 100 tests required for testing conformance of CGM Interpreter products. The objective of the CGM interpreter product testing program is to determine whether a given product, in this case a CGM Interpreter, can correctly and completely parse any CGM file (that satisfies both FIPS 128 and MIL-D-28003A), and produce the intended picture.

00,425
PB93-178655 PC A04/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Data Probe User's Guide. National PDES Testbed Report Series.
D. A. Sauder. Mar 93, 61p, NISTIR-5141.
Sponsored by Assistant Secretary of Defense (Production and Logistics), Washington, DC. Computer Aided Acquisition and Logistic Support Office.

Keywords: *Software tools, Man machine systems, Man computer interface, File management systems, Specifications, Models, Data processing, *Data Probe computer program, *STEP(Standard for the Exchange of Product Model Data), National Institute of Standards and Technology, PDES(Product Data Exchange using STEP), Express modeling language.

Data Probes are software tools built using the emerging International Standard for the Exchange of Product Model Data (STEP). A Data Probe is created from an information model written in the Express modeling language. A Data Probe is used to create, edit, or view data that conforms to the specification found in the information model from which it is created. It is also used to conveniently view information from the information model. Data Probe was built at the National Institute of Standards and Technology (NIST) to assist in the development of STEP. A Data Probe may, however, be used by anyone that wishes to create and edit data corresponding to an information model. Data Probe is available as public domain software. The document explains what Data Probes are, discusses what is involved in creating a Data Probe, explains how to run a Data Probe, and provides a detailed explanation of the commands needed to use a Data Probe.

00,426
PB93-208114 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Requirements for an Application Protocol Development Environment. National PDES Testbed Report Series.
A. B. Feeney, S. N. Clark, and J. E. Fowler. 27 May 93, 18p, NISTIR-5197.
Sponsored by Assistant Secretary of Defense (Production and Logistics), Washington, DC. Computer-aided Acquisition and Logistic Support Program.

Keywords: *Computer aided design, *Computer aided manufacturing, *Requirements, Computer software, Standards, *APDE(Application Protocol Development Environment), *Application Protocols, PDES(Product Data Exchange using STEP), STEP(Standard for the Exchange of Product Model Data).

The National Product Data Exchange using STEP (PDES) project at the National Institute of Standards and Technology (NIST) is focused on the development and implementation of the emerging International Standard for the Exchange of Product Model Data (STEP). One sub-project within the Testbed is the effort to establish an Application Protocol Development Environment (APDE). The report documents the requirements for an APDE. The requirements provide guidance as to what capabilities an APDE should provide.

00,427
PB94-109220 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Validation Testing System: Reusable Software Component Design. National PDES Testbed Report Series.
K. C. Morris, D. Sauder, and S. Ressler. Oct 92, 38p, NISTIR-4937.
See also PB92-143726 and PB92-143734. Sponsored by CALS Evaluation and Integration Office, Washington, DC.

Keywords: *Tests, *Computer systems programs, Object-oriented programming, Computer program verification, Computer software, Subroutine libraries, Computer aided design, Computer aided manufacturing, Software engineering, *PDES(Product Data Exchange using STEP), *STEP(Standard for the Exchange of Product Model Data), *Information models, Software reuse, VTS(Validation Testing System).

The International Organization for Standardization (ISO) Standard for the Exchange of Product Model Data (STEP) addresses the need to share data across multiple enterprises and hardware platforms by providing information models which clearly and unambiguously describe data. The validity of these Information models is essential for success in sharing data in a highly automated business environment. The design of software, which supports the testing of these information models for validity and correctness, is described in the document. This design follows the requirements and architecture described in previous Validation Testing System (VTS) project documents. The software libraries described in the document may be reused in a number of STEP applications. The Testbed is used to validate information models for STEP. The scope of the document is limited to the design of those components of VTS software scheduled for development in the initial phase of the project.

00,428
PB94-114501 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Factory Automation Systems Div.
SGML DTD for the STEP Integrated Resource Parts. National PDES Testbed Report Series.
S. Bodarky, and S. W. Paisley. 8 Jul 93, 36p, NISTIR-5224.

Keywords: *Documents, *Standards, Product development, Automation, *STEP(Standard for the Exchange of Product Model Data), *SGML(Standard Generalized Markup Language), *DTD(Document Type Definition), Integrated resources, APDE(Application Protocol Development Environment).

The Standard for the Exchange of Product Model Data (STEP) is emerging under the International Organization for Standardization (ISO). One major component of this standard is a series of documents called Integrated Resources. The purpose of this document is to present a Document Type Definition (DTD) for the Integrated Resources, in the Standard Generalized Markup Language (SGML). The DTD is a template that encapsulates and formalizes the structure of the Integrated Resources, and permits their semantic content to be converted into SGML. This serves to encode the structure of the Integrated Resources in a formalized, software-based system, thereby eliminating many vagaries of human interaction that are inherent in work done by large committees across International boundaries.

Computer Aided Manufacturing (CAM)

00,429
PB93-152163 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Factory Automation Systems Div.
Report on Scoping the Apparel Manufacturing Enterprise.
Interim rept.
H. T. Moncarz, and T. Y. Lee. Jan 93, 33p, NISTIR-5106.
See also PB90-247438, AD-A250 897, and AD-A249 193. Sponsored by Defense Logistics Agency, Alexandria, VA. Mfg. Engineering Branch.

Keywords: *Clothing industry, *Computer aided manufacturing, *Standardization, Automation, Integrated systems, Application Protocols, PDES(Product Data Exchange Using STEP), STEP(Standard for the Exchange of Product Model Data), Units of Functionality.

The paper identifies a set of manufacturing data interfaces that could be standardized for the effective computer integration of the information required to operate an apparel manufacturing enterprise. The interfaces are called Application Protocols. A method is described to use pieces of information, referred to as Units of Functionality, as building blocks for designing Application Protocols.

00,430
PB93-158665 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Factory Automation Systems Div.
Prototype Application Protocol for Ready-to-Wear Pattern Making.
Interim rept.
Y. T. Lee, and H. T. Moncarz. Jan 93, 35p, NISTIR-5115.
Contract DLA92-R/D-4
See also PB90-247438 and PB91-216663. Sponsored by Defense Logistics Agency, Alexandria, VA. Mfg. Engineering Branch.

Keywords: *Clothing Industry, *Computer aided manufacturing, *Data transfer(Computers), Patterns, Proto-

types, Pattern making, Tests, Models, *Application protocols, STEP(Standard for the Exchange of Product Model Data), PDES(Product Data Exchange using STEP).

A Ready-to-Wear Pattern Making Information Model is introduced for extending the emerging international Standard for the Exchange of Product Model Data (STEP) to include the exchange of apparel pattern data. The model focuses on a representation of two-dimensional (flat) patterns generated by the traditional ready-to-wear pattern making and grading method. A testing methodology of the information model is also described in the paper.

00,431
PB93-166304 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Center for Manufacturing Engineering.
Research, Industry and Technology Transfer at the NIST AMRF.
Final rept.
D. A. Swyt. 1991, 2p.
Pub. in Proceedings of Triennial World Congress of the International Federation of Automatic Control (11th), Tallin, USSR, August 13-17, 1990, v1 p71-72 1991.

Keywords: *Computer aided manufacturing, *Research and development, *Technology transfer, Automation, Robotics, Machine tools, Government/industry relations, Standards, Reprints, *Automated Manufacturing Research Facility, National Institute of Standards and Technology.

The paper, which deals with the Automated Manufacturing Research Facility (AMRF) at the U.S. National Institute of Standards and Technology (NIST), outlines briefly the nature of AMRF research, interactions with industry, and principal mechanisms of technology transfer to large-, medium- and small-size firms.

00,432
PB93-189801 PC A04/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Factory Automation Systems Div.
Strategic Plan for the Factory Automation Systems Division.
H. M. Bloom. Mar 93, 61p, NISTIR-5148.
See also PB92-205392.

Keywords: *Computer aided manufacturing, *Automation, Standards, Interfaces, Systems engineering, Financing, Organizational structure, Facilities, *National Institute of Standards and Technology, Concurrent engineering, Automated Manufacturing Research Facility, PDES(Product Data Exchange using STEP), STEP(Standard for the Exchange of Product Model Data).

The objective of the report is to present the strategic plan for the Factory Automation Systems Division. A vision of 21st century manufacturing is presented in terms of the Implementation of the 'Virtual Enterprise' and the use of Multi-Enterprise Concurrent Engineering. An environmental assessment is made of the Flexible Computer Integrated Manufacturing and Systems Management technologies. The goals and objectives of the Division are stated in terms of these technologies. The programs in the Division are described and the long term program objectives are given. Plans for additional funding, resources, and facilities are given in terms of program requirements.

00,433
PB93-199164 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Robot Systems Div.
ADACS. An Automated System for Part Finishing.
K. Stouffer, J. Michaloski, B. Russell, and F. Proctor. Apr 93, 14p, NISTIR-5171.
See also PB93-116416.

Keywords: *Computer aided manufacturing, *Robotics, *Chamfering, *Deburring, Automation, Real time systems, Control systems, Controllers, Computer architecture, Interactive graphics, Feature extraction, *ADACS(Advanced Deburring and Chamfering System).

The paper describes an automated finishing system called the Advanced Deburring and Chamfering System (ADACS). ADACS uses the Real-Time Control System (RCS), a hierarchical controller architecture that was developed at the National Institute of Standards and Technology (NIST). ADACS uses a graphical user interface that prompts an operator to specify chamfering edges and cutting parameters for the part. Given the operator-designated chamfering edges, ADACS uses this edge information to extract features - such as inside corner - to generate a finishing process plan. ADACS interprets the finishing plan to generate motion trajectories that are tightly coupled to the tooling control. Because of the inaccuracies in robotic position control, ADACS uses active force control in the tool to compensate for any small position errors along the finishing path. A prototype ADACS has successfully processed aerospace test parts.

00,434
PB94-112430 PC A04/MF A01
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD.
Intelligent Processing of Materials, Technical Activities 1992. (NAS-NRC Assessment Panel, February 2-3, 1993).
H. T. Yolken, and G. Bimbaum. 1993, 69p, NISTIR-4963.
See also PB92-112572.

Keywords: *Artificial Intelligence, *Process control, *Materials, *Nondestructive tests, Steels, Polymers, Expert systems, Computer aided manufacturing, Ceramics, Detectors, On-line systems, Research projects, Standards.

In 1992, the Office of Intelligent Processing of Materials continued its major focus on cooperative programs with industry to establish concepts for intelligent processing of materials. The research activities are grouped into two major areas: Materials Processing; and On-Line and Nondestructive Evaluation (NDE) Sensors. The first deals with process modeling, development of sensors for on-line process control and the development and validation of process models, and in some cases, integration of these elements with an expert computer control system to demonstrate key aspects of intelligent processing of materials. Whereas, in the first area the research on sensors is tied closely to specific processes, the work on NDE sensors in the second area, while motivated by on-line applications, is not necessarily linked with process models or intelligent processing.

Computer Software

00,435
PB94-120623 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Shtolo-Converting STEP Short Listings to Annotated Listings. National PDES Testbed Report Series.
D. Libes. 8 Nov 93, 14p, NISTIR-5291.
See also PB90-250077 and PB93-220838. Sponsored by CALS Evaluation and Integration Office, Washington, DC.

Keywords: *Software tools, Data processing, Automation, Computer aided design, Computer aided manufacturing, *STEP(Standard for the Exchange of Product Model Data), *Application Protocols, Shtolo computer program, PDES(Product Data Exchange using STEP), National Institute of Standards and Technology, EXPRESS.

The Standard for the Exchange of Product Model Data (STEP) Application Protocol includes an Application Interpreted Model (AIM) EXPRESS Annotated Listing. An Annotated Listing is created by combining the Short Listing and any objects from STEP Integrated Resource Parts that are referenced from the Short Listing either directly or indirectly. A number of transformations are performed on the resulting model, which is then formatted and printed. In the past, this process has been carried out by hand. This document describes Shtolo, a tool to automate this process. Shtolo conforms to EXPRESS Part 11 and The Supplementary Directives for the Drafting and Presentation of ISO 10303 allowing direct inclusion of the result into an Application Protocol specification. Shtolo relies on the National Institute of Standards and Technology (NIST) EXPRESS Toolkit and the NIST EXPRESS Pretty Printer.

00,436
PB94-120664 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
NIST EXPRESS Toolkit: Introduction and Overview. National PDES Testbed Report Series.
D. Libes. 25 Oct 93, 12p, NISTIR-5242.
See also PB90-265273 and PB91-107235. Sponsored by CALS Evaluation and Integration Office, Washington, DC.

Keywords: *Software tools, Subroutine libraries, Compilers, History, Computer aided design, Computer aided manufacturing, *National Institute of Standards and Technology, EXPRESS, STEP(Standard for the Exchange of Product Model Data), PDES(Product Data Exchange using STEP).

The National Institute of Standards and Technology (NIST) EXPRESS Toolkit is a software library for building EXPRESS-related tools. This paper gives an introduction, overview, and history of the toolkit. The paper also describes how to get more information on the toolkit. No knowledge of EXPRESS Toolkit is presumed other than a rudimentary grasp of basic computer science.

Joining

00,437
PB93-166106 Not available NTIS
National Inst. of Standards and Technology (IMSE), Boulder, CO. Fracture and Deformation Div.
Standard Formats for Welding Property Data.
Final rept.
T. A. Siewert. 1992, 5p.
Pub. in Proceedings of Conference on Computerization of Welding Information III, Ypsilanti, MI., September 12-14, 1990, p44-48 1992.

Keywords: *Welding, *Formats, *Mechanical properties, *Weld metal, Weldability, Data bases, Standards, Weldments, Specifications, Standardization, Reprints, *Welding procedure specification.

Standards societies are actively pursuing the development of standard formats for a wide range of material property data. For welding, most activity has been within AWS Committee A9 Computerization of Welding Information and ASTM Committee E49 Computerization of Material Property Data. The ASTM Committee scope covers engineering materials and properties, and has 29 documents in various stages of completion. Members of the ASTM Committee represent the entire spectrum of material properties and have the expertise to develop generic specifications so the various data formats are compatible. The AWS Committee is concerned specifically with welding data, and has the expertise to produce the most precise documents for this discipline. Together, they are producing weld standards that are fully compatible with the standards for the other materials, but are suitable for the widest possible variety of welding applications. At present, two standards are under development, one covering the identification of welds and the other covering the properties of welds. This report provides more details on these standards.

Manufacturing, Planning, Processing & Control

00,438
PB93-166163 Not available NTIS
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Precision Engineering Div.
Comparison between Precision Roughness Master Specimens and Their Electroformed Replicas.
Final rept.
J. F. Song, T. V. Vorburger, and P. Rubert. 1992, 7p.
Pub. in Precision Engineering 14, n2 p84-90 Apr 92.

Keywords: *Surface roughness, *Precision, *Profiles, *Electroforming, Quality control, Calibration, Errors, Surface properties, Profilometers, Reproducibility, Reprints.

Two random profile precision roughness calibration specimens with Ra=0.028 and 0.043 micrometer m are compared with their electroformed replicas. Measurements of surface texture and roughness parameter val-

ues show very good agreement. Fluctuations in the Ra values across the replicas track those across the masters to within 1.8 nm. However, the form errors of the replicas, approximately 0.6 micrometer over a 3.2 x 2.6 sq mm area, are much bigger than those of the masters, and their hardness (HV=243) is not as good as the master specimens' (HV=852).

00,439
PB93-189793 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Factory Automation Systems Div.
National Testbed for Process Planning Research.
S. R. Ray, and A. B. Feeney. Apr 93, 20p, NISTIR-5169.
See also PB92-226307.

Keywords: *Research and development, Information services, Laboratories, Research management, *Process planning, *National Institute of Standards and Technology, Testbeds.

The National Institute of Standards and Technology (NIST) is in the process of establishing a testbed which will serve the research and information needs of the process planning community. The testbed is building up four primary services designed to facilitate the development of process planning technology: information services, workshops, a testing and integration laboratory, and a collaborative research program. Each of these services is described, along with their motivation and expected impact.

00,440
PB93-192318 PC A11/MF A03
National Inst. of Standards and Technology (MEL), Gaithersburg, MD.
Proceedings of the Joint DoD/NIST Workshop on International Precision Fabrication Research and Development. Held in Rockville, Maryland on October 27-29, 1992.
Special pub.
J. D. Meyer. Mar 93, 250p, NIST/SP-849.
Also available from Supt. of Docs. as SN003-003-03204-2. Sponsored by Department of Defense, Washington, DC. Mfg. Technology Program.

Keywords: *Meetings, *Fabrication, *Research and development, Global, Manufacturing, Machining, Grinding(Material removal), Technology Innovation, Precision, Microfabrication.

Contents:
Introductory Remarks;
Precision Manufacturing Practice and Research: A North American Perspective;
Western European R&D Programs and Sources of Funding;
Precision Fabrication Technology in the Former Soviet Union and Other East European Countries;
Precision Fabrication of Japan in 1993;
Worldwide Microfabrication Research and Development.

00,441
PB93-209930 PC A04/MF A01
Georgia Inst. of Tech., Atlanta. School of Public Policy.
Federal-State Collaboration in Industrial Modernization.
P. Shapira, J. D. Roessner, and R. Barke. Jul 92, 70p.
Grant SBNB1C6728
Sponsored by National Inst. of Standards and Technology (TS), Gaithersburg, MD. State Technology Extension Program.

Keywords: *Project management, *Industries, *Manufacturing, *United States, Government agencies, Technical assistance, Government/industry relations, Personnel development, Technology transfer, On job training, National government, State government, Technology assessment, Quality control, Improvement, Grants, *Modernization, Omnibus Trade and Competitiveness Act of 1988, State Technology Extension Programs(STEP), Small firms.

To promote industrial modernization among U.S. firms, especially small and midsized ones, the 1988 Omnibus Trade and Competitiveness Act mandated the National Institute of Standards and Technology (NIST) to take a greater role in diffusing new manufacturing technologies. The report considers federal-state collaboration in industrial modernization, focusing particularly on NIST and its role and potential for strengthening the system, through STEP and similar programs. After examining the multidimensional nature of the industrial modernization problem, the report assesses current federal and state practices and federal-state relations in the modernization field.

00,442
PB93-217578 PC A23/MF A04
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Machining of Advanced Materials: Proceedings of the International Conference on Machining of Advanced Materials. Held in Gaithersburg, Maryland on July 20-22, 1993.
Special pub.
S. Jahanmir. Jun 93, 537p, NIST/SP-847, ISBN-0-16-041820-8.
Also available from Supt. of Docs. as SN003-003-03218-2. Sponsored by National Science Foundation, Washington, DC., and Department of the Navy, Washington, DC.

Keywords: *Machining, *Composite materials, *Meetings, US NIST, Grinding(Material removal), Surface roughness, Precision, Abrasive machining, Milling(Machining), Laser cutting, Ceramics, Proceedings.

The present volume contains papers presented at the International Conference on Machining of Advanced Materials, held at the National Institute of Standards and Technology, Gaithersburg, Maryland, July 20-22, 1993. The goal of the conference was to strengthen communication and technology transfer among researchers and engineers involved in various aspects of machining as related to ceramics and composites. The following topics are included in these proceedings: traditional and nontraditional machining and finishing techniques; mechanisms of material removal; nondestructive evaluation and characterization of machining damage; effect of machining damage on performance and properties; sensors for in-process measurement of surface quality; special cutting tools and cutting/grinding fluids for advanced materials; new machine tool designs; novel concepts for machining of advanced materials; and machining of advanced materials for specialized applications, including biological implants.

Quality Control & Reliability

00,443
PB93-124816 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Center for Electronics and Electrical Engineering.
Metrology is More Than Calibration: Letting Others Know That Measurements Matter.
Final rept.
B. C. Belanger. 1989, 9p.
Pub. in Proceedings of Measurement Science Conference, Anaheim, CA., January 26-27, 1989, p1-9.

Keywords: *Metrology, *Measurements, Government/industry relations, Calibration, Reprints, US NIST.

Anecdotal illustrations of the impact of improved measurements are given to support the thesis that metrology is much more than the routine calibration of instruments as is sometimes the perception. Examples taken from NIST's experiences in serving a variety of industries and government agencies are cited in this paper to prove the point that better measurements are essential tools for solving technical problems, reducing testing costs, and improving industrial productivity.

00,444
PB93-151744 Not available NTIS
National Inst. of Standards and Technology (MSEL), Boulder, CO. Materials Reliability Div.
Quantitative Evaluation of Distributed Pores in Reference Radiographs.
Final rept.
T. A. Siewert, C. N. McCowan, D. Polansky, and T. S. Jones. 1992, 3p.
Pub. in Welding Jnl., p31-33 Aug 92.

Keywords: *Radiography, *Image analysis, *Weldments, Aluminum, Nondestructive tests, Porosity, X-ray analysis, Welding, Standards, Reprints.

During the development of a set of reference radiographs for aluminum (Al) welds, we invited experienced radiographic interpreters to review candidate radiographs so that the set would accurately represent industrial usage. Quantitative evaluation of the same radiographs with a digital image analyzer revealed that the different radiographers were quite consistent in selecting a maximum acceptable level of porosity (measured as pore area fraction in the weld). This was true for three different grade series: coarse and fine pores in welds with 12-mm-thick Al plate, and fine pores in 3-mm-thick plate. The radiographers also selected intermediate grades (levels of severity) in a nearly geometric progression of area fraction. We have found a similar maximum pore area fraction and a geometric progression of area fraction (in a graded series) in other radiographic acceptance standards, although most standards do not present the data in these units. We suggest that a numerical evaluation procedure can be developed for impartial and quantitative ranking of flaw severity in radiographs. A numerical evaluation procedure would allow further automation and would be especially useful in cases where conformance to a standard is disputed.

00,445
PB93-166676 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Statistical Engineering Div.
Renewal Look at Switching Rules in MIL-STD-105D.
Final rept.
G. L. Yang. 1990, 10p.
Pub. in Jnl. of Applied Probability 27, n1 p183-192 1990.

Keywords: *Quality control, *Sampling, Quality assurance, Standards, Inspection, Markov chains, Reprints.

A sampling system, MIL-STD-105D, used in quality control consists of three sampling plans with different acceptance probabilities alternatingly used for lot inspection. The decision to switch plans is based on the history of the lot acceptance records and a set of stopping rules. The author derives the performance measure, Average Outgoing Quality (AOQ), of this sampling system from a renewal process in which AOQ is expressed in terms of the moments of the stopping times. The renewal approach is simpler than that of the Markov chain generally used in computing AOQ for an infinite sequence of lots. It also provides a formula for AOQ for a finite sequence of lots.

00,446
PB93-173466 PC A06/MF A02
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Materials Reliability Div.
Materials Reliability. Technical Activities, 1992. (NAS-NRC Assessment Panel, May 13-14, 1993).
H. I. McHenry, and C. M. Fortunko. May 93, 103p, NISTIR-4965.
See also PB92-126424.

Keywords: *Research projects, *Materials, *Reliability, Composite materials, Standards, Nondestructive tests, Cryogenics, Composite materials, Ultrasonic tests, Thermomechanical treatment, Welding, Mechanical properties, Process control(Industry), Performance evaluation, Physical properties, Steels, *Advanced materials.

The Materials Reliability Division conducts materials research to improve the quality, reliability, and safety of Industrial products and the nation's infrastructure. The authors' research fosters the use of advanced materials in commercial products by improving confidence in their service performance. The authors do this by developing measurement technology for: process control which improves the quality, consistency and producibility of materials; nondestructive evaluation (NDE) which assures the quality of finished materials and products; fitness-for-purpose standards which relate material quality to reliability and safety; and materials evaluation for severe applications, particularly for service at cryogenic temperatures. Early in FY92, the authors reorganized the Division to build a stronger group structure. The report summarizes the Division programs, and it is organized according to the three groups: materials characterization; process sensing and modeling; and structural materials.

00,447
PB93-175990 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Factory Automation Systems Div.

User's Guide for the Algorithm Testing System/ Version 1.1.
C. Diaz. Feb 93, 45p, NISTIR-5137.
Sponsored by Naval Research Lab., Washington, DC. Navy Manufacturing Technology Program.

Keywords: *Verification inspection, *Computer software, *Fitting, *Computer program verification, Algorithms, Testing, Metrology, Measuring instruments, Geometry, User manuals(Computer programs), National Institute of Standards and Technology.

The National Institute of Standards and Technology (NIST) Algorithm Testing System (ATS) is a software package for evaluating the performance of geometric fitting software. The report is a user's guide to the ATS. The user's guide documents the detailed description of the system operation.

00,448
PB93-184331 PC A05/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Precision Engineering Div.
Issues, Concepts, and Standard Techniques in Assessing Accuracy of Coordinate Measuring Machines.
Technical note.
D. A. Swyt. Feb 93, 91p, NIST/TN-1400.
Also available from Supt. of Docs. as SN003-003-03200-0.

Keywords: *Dimensional measurement, Computerized control systems, Laser applications, Tolerances(Mechanics), Distance measuring equipment, Displacement measurement, Performance evaluation, Comparative evaluations, Extensions, Metrology, Accuracy, Length, Tests, Japan, Germany, Great Britain, USA, *Coordinate measuring machines, Intercomparison.

The report deals with a variety of issues, concepts and standard techniques in assessing the accuracy of measurements of modern laser-based computer-controlled coordinate measuring machines. It outlines technical issues in assessing conformity of dimensions of manufactured parts to design tolerances with such CMM's, uses a new system of length-dimensional types (displacement, position, distance and extension) as the basis for an error-budget analysis of CMM measurement capabilities and, based on that system, intercompares U.S., German, British and Japanese CMM performance standards, showing that the U.S. standard provides separate test of a CMM's capability to measure of each length-dimensional type and the part features associated with them.

00,449
PB93-189819 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Precision Engineering Div.
Measurement Uncertainty Considerations for Coordinate Measuring Machines.
S. D. Phillips, B. Borchardt, and G. Caskey. Apr 93, 35p, NISTIR-5170.
See also PB92-164680 and PB93-159465.

Keywords: *Dimensional measurement, *Tolerances(Mechanics), Confidence limits, Uncertainty, Accuracy, Coordinate measuring machines.

The report examines some uncertainty considerations for dimensional measurements performed on a three axis coordinate measuring machine (CMM). The interaction between measurement uncertainty and part tolerance is briefly presented, and the factors affecting CMM measurements are discussed and their uncertainty described using the approach recommended by the International Committee for Weights and Measures (CIPM). Several of the current technical difficulties which make a rigorous uncertainty evaluation problematic are considered, and some simple examples are presented.

00,450
PB93-198455 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Factory Automation Systems Div.
Dimensional Inspection Planning Based on Product Data Standards. National PDES Testbed Report Series.
S. C. Feng. 18 May 93, 34p, NISTIR-5183.

Keywords: *Dimensional measurement, *Inspection, *Standards, Computer aided design, Models, Information processing, Planning, Computer aided manufacturing, *DMIS(Dimensional Measuring Interface Standard), CMMs(Coordinate Measuring Machines), STEP(Standard for Exchange of Product Model Data).

An international standard on product data representation and exchange for dimensional inspection planning is being developed. The paper provides a review of fundamental technology enabling the standard development and describes the current status of an activity model. The model defines functional requirements of the standard. A set of diagrams has been generated to represent the activity and its sub-activities, inputs, outputs, controls and mechanisms, when such planning is based on technologies of product data exchange, process planning and information modeling.

00,451
PB93-217529 PC A07/MF A02
National Inst. of Standards and Technology, Gaithersburg, MD. Office of Weights and Measures.
State Weights and Measures Laboratories: State Standards Program Description and Directory. 1993 Edition.
Special pub.
G. L. Harris. Jun 93, 132p.
Supersedes PB92-183698. Also available from Supt. of Docs. as SN003-003-03220-4.

Keywords: *Laboratories, *Standards, *Directories, Units of measurement, States(United States), Puerto Rico, Virgin Islands, Tolerances(Mechanics), Calibration, Tests, *State services, *Weights and measures, National Type Evaluation Program, State Standards Program, Accreditation.

In support of its mission to promote uniform standards of measurement throughout the country, the National Institute of Standards and Technology (NIST) received funding in 1965 to provide new standards of mass, length, and volume to State weights and measures laboratories. The program, called the (New) State Standards Program, also provided the equipment needed to perform calibrations in these measurement areas. Part I describes the accreditation program whereby NIST accredits State weights and measures laboratories. Part II is the directory of State weights and measures laboratories and lists the services they provide to State and local weights and measures agencies as well as to industry. The directory is intended to assist potential users of the laboratory services in locating and obtaining needed measurement services.

00,452
PB93-234680 PC A04/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Automated Production Technology Div.
Some Guidelines for Implementing Error Compensation on Machine Tools.
M. A. Donmez, K. W. Yee, and B. Damazo. Aug 93, 62p, NISTIR-5236.
See also PB89-150874 and PB91-112771.

Keywords: *Mathematical models, *Machine tools, *Errors, Accuracy, Compensation, Turning(Machining), Deflections, Wear.

Some guidance is presented for implementing error compensation for geometric and thermally induced errors of a machine tool. Error compensation has the potential for relatively low cost improvements in the accuracy of finished parts since machines are more repeatable than accurate and most errors are predictable and can be compensated. Measurement of individual error components and the development of a rigid-body, kinematic model of the machine tool is discussed. Some methods of implementing the predicted error compensation on existing machine-tools controllers is presented.

Research Program Administration & Technology Transfer

00,453
PB93-209922 PC A03/MF A01
Georgia Inst. of Tech., Atlanta. School of Public Policy.
Japan's Kohsetsushi Program of Regional Public Examination and Technology Centers for Upgrading Small and Mid-Size Manufacturing Firms. Presented at Annual Meeting of the Association of American Geographers. Held in Miami, Florida in April 1991.
P. Shapira. 1991, 49p.
Grant NANBOD1047
Sponsored by National Inst. of Standards and Technology, Gaithersburg, MD., and West Virginia Univ., Morgantown.

Keywords: *Japan, *Manufacturing, *Research and development, Small businesses, Case studies, Technology innovation, Technology utilization, Program evaluation, Kohsetsushi program.

The study investigates Japan's Kohsetsushi program of regional public examination and technology centers. These centers provide research services, testing, training, and technology guidance for small and medium-size enterprises. After a review of the role of small and mid-size manufacturing enterprises in Japan and an analysis of their use of a range of new technologies, the study is organized into three sections: (1) An examination of the operation and services of the five case study Kohsetsushi centers; (2) a discussion of developments and problems in the use of technology by ten small Japanese manufacturers; and (3) an assessment of the strengths and weaknesses of the Kohsetsushi program, based on the program and firm case studies.

Robotics/Robots

00,454
PB93-146660 PC A03/MF A01
Florida Atlantic Univ., Boca Raton.
Autonomous Obstacle Avoidance Using Visual Fixation and Looming.
K. Joarder, and D. Raviv. Dec 92, 27p, NISTIR-4996.
Sponsored by National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Robot Systems Div.

Keywords: *Obstacle avoidance, Robot dynamics, Robot arms, Computer vision, *Robot navigation, Visual fixation, Visual looming.

The paper describes a vision-based method for avoiding obstacles using the concepts of visual looming and fixating motion. Visual looming refers to the expansion of images of objects in the retina. Usually, this is due to the decreasing distance between the observer and the object. An increasing looming value signifies an increasing threat of collision with the object. The visual task of avoiding collision can be further simplified by purposive control of visual fixation at the objects in front of the moving camera. Using these two basic concepts real time obstacle avoidance in a tight perception-action loop is implemented. 3D space in front of the camera is divided into zones with various degrees of looming-based threat of collision. For each obstacle seen by a fixating camera, looming and its time derivative are calculated directly from the 2D image. Depending on the threat posed by an obstacle, a course change is dictated. This looming based approach is simple, independent of the size of the 3D object and its range and involves simple quantitative measurements. Results pertinent to a camera on a robot arm navigating between obstacles are presented.

00,455
PB93-166551 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Precision Engineering Div.
Use of Contact Type Measurement Device to Detect Robots' Hand Positions.
Final rept.
N. Vira, and T. Estler. 1990, 20p.
Pub. in ISA Transactions 29, n4 p21-40 1990.

Keywords: *Robots, *Position(Location), *Measuring instruments, Testing, Performance evaluation, Calibrating, Accuracy, Manufacturing, Standardization, Reprints, National Institute of Standards and Technology.

The article presents procedures for using a contact type measurement device to detect and calibrate robots' hand positions. The device used has recently been designed and manufactured at the National Institute of Standards and Technology (NIST) and is suitable for testing industrial robots utilized in precision

manufacturing operations. The device measures accuracy and repeatability of robot hand positions in a three-dimensional work space. The need of such measurement device is well documented in the literature; however, prime reason can be summarized in a bi-fold: first, there exists a need to provide an industrial type inexpensive measurement system applicable to test a wide variety of robots; and second, standardization on measurement methodologies and procedures are highly desired, thus common ground rules can be established between manufacturers and robot users. The device used here for a robot testing has an accuracy of 34 m and is considered as contact type apparatus because it directly connects to a fixture affixed to the robot hand. To compare the device usage, and describe its usefulness, the article highlights four other measurement systems that are in the process of development at NIST.

00,456
PB94-112422 PC A07/MF A02
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Robot Systems Div.
Report of the ARPA/NIST Workshop on Performance Evaluation of Unmanned Ground Vehicle Technologies.
M. Herman. Aug 93, 142p, NISTIR-5237.
Proceedings of a conference held in Gaithersburg, MD. on September 16-17, 1992. Sponsored by Defense Advanced Research Projects Agency, Arlington, VA.

Keywords: *Unmanned, *Ground vehicles, *Meetings, Technology innovation, Navigation, Automatic control, Tests, Target acquisition, ARPA(Advanced Research Projects Agency).

The ARPA Unmanned Ground Vehicle (UGV) Demo II program is developing intelligent, semi-autonomous UGVs to perform cooperative tasks in militarily significant scenarios. As part of the program, NIST ran a workshop on UGV performance evaluation in September 1992. The workshop examined the various UGV technologies and aspects of performance that need to be evaluated, including sensing for navigation and driving (vision, stereo, laser, infrared, etc.), planning (mission planning, path planning, etc.), reconnaissance, surveillance, and target acquisition (RSTA), and the integrated perception/planning/control vehicle system. The focus of the workshop was on the breakout of the attendees into working groups. The document presents reports prepared by these working groups.

Tooling, Machinery, & Tools

00,457
DE93010922 PC A02/MF A01
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Automated Production Technology Div.
Real-time compensation for tool form errors in turning using computer vision.
G. Nobel, M. A. Donmez, and R. Burton. 1990, 9p, DOE/OR/21584-T1.
Contract AI05-85OR21584
Sponsored by Department of Energy, Washington, DC.

Keywords: *Cutting Tools, Adjustments, Computerized Control Systems, Real Time Systems, Tolerance, EDB/420200.

Deviations from the circular shape of the cutting edge of a single-point turning tool cause form errors in the workplece during contour cutting. One can compensate for these tool-form errors by determining the size of the effective deviation at a particular instant during cutting, and then adjusting the position of the cutting tool accordingly. An algorithm for the compensation of tool-nose-radius errors in real time has been developed and implemented on a CNC turning center. A previously developed computer-vision-based tool- inspection system is used to determine the size of the deviations. Information from this system is fed to the error compensation computer which modifies the tool path in real time. Workpieces were cut utilizing the compensation system and were inspected on a coordinate measuring machine. Significant improvements in workplece form were obtained.

00,458
PB93-139004 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Precision Engineering Div.
Comparison of National Standards for the Performance Evaluation of Coordinate Measuring Machines in Terms of Length-Based Dimensional Quantities.
D. A. Swyt. Nov 92, 15p, NISTIR-4978.

Keywords: *Dimensional measurement, *Standards, Interlaboratory comparisons, Performance evaluation, Comparison, Length, Great Britain, Germany, Japan, USA, *Coordinate measuring machines, ASME B89.1.12, JIS B7440, B5 6808, VDI/VDE 2617.

The paper compares U.S., German, British and Japanese standards for evaluation of coordinate measuring machines and shows that using a variety of special artifacts the U.S. standard alone specifies separate tests for each of the four modes of length measurements (displacement, position, distance and extension) and that, depending on the number and orientations of faces probed, a bi-directional step gage of the type suggested in the other standards can be used for tests of each of these four modes.

00,459
PB93-158731 PC A11/MF A03
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Development of a Fast-Response Variable-Amplitude Programmable Reaction Control System.
W. C. Stone. Jan 93, 233p, NISTIR-5118.

Keywords: *Control systems, *Microprocessors, Amplitude, Piezometers, Pulse width, Systems analysis, Sensors, Fuel injectors, Tests, Computer programs, HSILS(High Speed Intelligent Loading System).

The report describes a high speed loading system comprised of: a piezoelectric stack and an associated microprocessor-based programmable DC power source; a low-loss mechanical displacement amplifier; a high pressure spring-loaded axial valve; an integral high pressure valve seat; an expansion nozzle; and a high pressure gas supply. A half square wave voltage signal of varying duration and amplitude was used to drive the piezoelectric stack in such a manner as to produce changing displacements which were subsequently amplified by a monolithically milled hinged anvil. The anvil is connected to a valve core which seats upon, and is normally forced closed upon a specially hardened throat of an expansion nozzle by means of a compression spring. The interior side of the thruster nozzle communicates with a high pressure gas supply. The flow of gas through the nozzle is normally prohibited by the spring loaded valve core. As the piezoelectric stack expands under computer control the valve core is lifted off the nozzle throat permitting gas to expand through the nozzle and create thrust that is directly proportional to the control signal from the microprocessor. The device is designed to operate as a stand-alone unit with a dedicated onboard microcontroller system and onboard energy storage system.

00,460
PB94-101821 PC A05/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Precision Engineering Div.
Bibliography of Screw Thread Measurement.
S. Laks, J. Raja, and T. Doiron. Jul 93, 86p, NISTIR-5223.
Prepared in cooperation with North Carolina Univ. at Charlotte.

Keywords: *Bibliographies, *Screw threads, *Dimensional measurement, Abstracts, Precision, Inspection, Tolerances(Mechanics), Threads, Screws, Industrial engineering.

The bibliography on screw thread measurement was compiled as background for an evaluation of the current state of the art. The bibliography covers screw thread measurement methods (lead, pitch diameter, etc.), tables for ball and wire methods, discussions of instruments for thread measurements, and papers on the basic geometry of thread forms. When possible the entire abstract is presented. The papers are presented in chronological order starting from 1890 to 1991.

00,461
PB94-118221 PC A04/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Automated Production Technology Div.
Portsmouth Fastener Manufacturing Workstation. Fastener Engraving System (Design, Construction, and Operation).
M. H. Hahn, and M. Huff. Feb 93, 68p, NISTIR-5271.
Sponsored by Office of the Assistant Secretary of the Navy, Washington, DC. Mfg. Technology Program.

Keywords: *Fasteners, *Computer-aided manufacturing, *Engraving, Production, Pneumatic equipment, Automatic control, Machine tools, Engineering drawings, Marking.

The Portsmouth Fastener workstation is an advanced fastener manufacturing workstation which produces high-quality, Level-1, safety-critical fasteners. For material traceability, each fastener manufactured must be marked with the manufacturer's identification, lot number, and material symbol. Currently, most of the markings are done manually using either a vibrating marking pen or a stamping die. Both methods are very labor intensive and expensive. A computer-controlled engraving machine is employed to semiautomate the marking process to improve productivity and enhance quality. The major problem encountered in engraving is the fixturing of fasteners in the machine in a quick and easy manner. This paper describes the NIST developed pneumatic fixturing system using an inflatable elastomeric gasket and customized engraving software, devices, and schemes that the operator can use to run the engraving system. A complete set of engineering drawings of the engraving fixture and an operator's manual are included in the Appendices.

Tribology

00,462
PB93-138949 PC A04/MF A01
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD.
Tribological Investigations of Composites and Other Selected Materials Sliding against Vacuum-Deposited MoS2 Coatings.
Final rept. 1989-92.
A. W. Ruff, and M. B. Peterson. Nov 92, 74p, NISTIR-4959.
Contract FY1457-91N-5026
Sponsored by Air Force Materials Lab., Wright-Patterson AFB, OH.

Keywords: *Roller bearings, *Molybdenum disulfide, *Composite materials, *Tribology, Friction tests, Wear tests, Space environments, Solid lubricants, Metal matrix composites, Films.

A new materials approach for rolling element bearings in space satellite systems involves the use of solid lubricating retainers and bearing elements vacuum-coated with MoS2. Improved vacuum deposition methods are now available to produce dense, suitably oriented, durable films of molybdenum disulfide. It is of interest to examine materials in sliding contact with such films in order to identify suitable combinations, and to further improve tribological performance of the system. Results of wear and friction measurements are presented on a number of materials including self-lubricating composites sliding against four different types of vacuum-deposited MoS2 films. The testing program used a controlled environment, pin-on-ring tribometer, with load and speed conditions appropriate to a possible application. Differences in wear over 4 orders of magnitude, and friction up to a factor of 7, were measured among the materials. Several promising material combinations are identified.

MATERIALS SCIENCES

General

00,463
PB93-151736 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Standard Reference Data.

Making Materials Database Standards International.
Final rept.
J. Rumble. 1989, 5p.
Pub. in ASTM (American Society for Testing and Materials) Standardization News, p32-36 Jun 89.

Keywords: *Data bases, *Materials, *Standards, International cooperation, Reprints, VAMAS project.

Standards for materials databases are being rapidly developed, especially within the United States. There is concern that these standards be harmonized on an international basis so that databases from different countries are compatible and information can be freely exchanged. The Versailles Project on Advanced Materials and Standards (VAMAS) held a workshop in November 1988 to set priority actions and to develop working relationships for national and international groups building materials database standards. Five areas were highlighted where the need for cooperation is most acute: materials identification, terminology harmonization, data exchange, data recording formats, and models for data evaluation and analysis. This article contains details on each of these.

Carbon & Graphite

00,464
PB93-153708 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Cathodoluminescence Imaging and Spectroscopy of CVD Diamond in a Scanning Electron Microscope.
Final rept.
L. H. Robins, L. P. Cook, E. N. Farabaugh, and A. Feldman. 1990, 12p.
Pub. in Proceedings of SPIE (Society of Photo-Optical Instrumentation Engineers) Diamond Opt. 2, v1146 p166-177 1990.

Keywords: *Chemical vapor deposition, *Defects, *Cathodoluminescence, *Spectrum analysis, Scanning electron microscopy, Silicon, Substrates, Comparison, Nonmetalliferous minerals, Synthetic materials, Reprints, *Diamond films.

Optically active defects in diamond films grown by the hot-filament chemical vapor deposition method were investigated by cathodoluminescence (CL) imaging and spectroscopy in a scanning electron microscope. A set of films grown on silicon substrates at deposition temperatures from 600 C to 840 C was studied. The spatial resolution of the CL images was approximately 0.2 to 0.5 micrometer; CL spectra were measured with wavelength resolution 0.4 nm in the wavelength range 350 to 900 nm. By comparing the CL spectra that the authors observed to the spectra of known types of defect in natural and synthetic diamond, the authors were able to identify the centers in their films.

Ceramics, Refractories, & Glass

00,465
AD-A273 624/7 Not available NTIS
National Inst. of Standards and Technology (IMSE), Gaithersburg, MD. Ceramics Div.
Surface Forces and Their Action in Ceramic Materials.
R. G. Horn. 1990, 20p.
Availability: Pub. in Jnl. of the American Ceramic Society, v73 n5 p1117-1135, 1990.

Keywords: *Ceramic materials, *Atoms, *Molecule molecule interactions, Colloids, Fracture(Mechanics), Solids, Solvation, Microstructure, Reprints, Electrostatic charge, Van der Waals forces, Polymers, *Surface forces, *Surface interactions, Interatomic forces.

A descriptive account is given of the surface forces acting between two solids. Different contributions to the force are outlined, with particular attention paid to the underlying mechanisms, and how they are affected by the nature of the medium between the surfaces. This is followed by a discussion of the areas of ceramic science and engineering in which surface forces play a role. Surface forces, Mechanisms, Ceramics, Colloids, Fracture mechanics.

00,466
DE93018740 PC A02/MF A01
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Equipment for Investigation of Cryogenic Compaction of Nanosize Silicon Nitride Powders.
W. Chen, G. J. Piermarini, S. J. Dapkunas, S. G. Malghan, and A. Pechenik. 1992, 10p, DOE/OR/22041-1.
Contract AI05-92OR22041
Sponsored by Department of Energy, Washington, DC.

Keywords: *Silicon Nitrides, *Compacting, Cryogenics, Powders, EDB/360201.

This paper describes a system for studies of time-dependent compaction of nanosize silicon nitride powders under various atmospheres at 77 to 1000 K. The system incorporates a screw-driven press (10 ton capacity) with a piston-cylinder type die and can produce cylindrical powder compacts, 3 mm dia and about 1 mm thick, using pressures up to 3 GPa. The system is computer-controlled and permits accurate measurements of the sample volume, and, after appropriate calibration, can determine the rate and degree of densification of the compacting powder as pressure is applied. Frictional forces between the piston and the die are measured during the compaction process. For calibration of the system, powders with known volume-change accompanied by phase transition under pressure were studied, and good agreement with published results was demonstrated. Several Si(sub 3)N(sub 4) samples have been compacted and sintered at 1300 to 1600(degrees)C. Max random packing density of 64% has been obtained using liquid nitrogen lubricant at pressure less than 2.5 GPa. Both green samples and samples sintered at temperatures to 1500(degrees)C were transparent.

00,467
N93-20188/7 (Order as N93-20178/8, PC A15/MF A03)
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD.
Principles of Gas Phase Processing of Ceramics during Combustion.
M. R. Zachariah. Feb 93, 7p.
In NASA. Lewis Research Center, the Second International Microgravity Combustion Workshop p 81-87.

Keywords: *Ceramics, *Combustion, *High temperature environments, *Vapor phases, Corrosion, Electrical properties, Mechanical properties, Optical properties, Reliability, Sintering, *Reduced gravity.

In recent years, ceramic materials have found applications in an increasingly wider range of industrial processes, where their unique mechanical, electrical and optical properties are exploited. Ceramics are especially useful for applications in high temperature, corrosive environments, which impose particularly stringent requirements on mechanical reliability. One approach to provide such materials is the manufacture of submicron (and more recently nanometer scale) particles, which may subsequently be sintered to produce a material with extremely high mechanical integrity. However, high quality ceramic materials can only be obtained if particles of known size, polydispersity, shape and chemical purity can be produced consistently, under well controlled conditions. These requirements are the fundamental driving force for the renewed interest in studying particle formation and growth of such materials.

00,468
PB93-153617 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
ASTM Committee, C28, Advanced Ceramics: A Progress Report.
Final rept.
G. Quinn. 1992, 3p.
Pub. in American Ceramic Society Bulletin 71, n10 p1508-1510 Oct 92.

Keywords: *Ceramics, *Standards, Flexural strength, Fracture properties, Powder testing, Reprints, *Advanced materials.

The article is a brief progress report on the activities in ASTM Committee C28, Advanced Ceramics. The American Ceramic Society Bulletin has a section: 'Standards Corner' for such articles. (The author is the vice-chairman of C28.)

00,469
PB93-153732 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Phase Equilibria and Crystal Chemistry in Portions of the System SrO-CaO-Bi2O3-CuO. Part 3. Preliminary Phase Diagrams for the Ternary Systems of SrO-Bi2O3-CuO, CaO-Bi2O3-CuO and SrO-CaO-Bi2O3.
Final rept.
R. S. Roth, B. P. Burton, and C. J. Rawn. 1990, 11p.
See also Part 2, PB90-256835.
Pub. in Ceram. Trans.-Supercond. Ceram. Supercond., v13 p23-33 1992.

Keywords: *Bismuth oxides, *Calcium oxides, *Copper oxides, *Strontium oxides, *Phase diagrams, High temperature superconductors, Ternary systems, X-ray diffraction, Single crystals, Crystal chemistry, Cuprates, Reprints, Phase equilibrium.

Ternary phase equilibria diagrams are presented for the systems SrO-Bi2O3-CuO, CaO-Bi2O3-CuO and SrO-CaO-Bi2O3. Binary and ternary phases have been characterized by single crystal x-ray diffraction and least squares analyses of x-ray powder diffraction patterns. No ternary phases were found in the CaO-1/2Bi2O3-CuO system but the SrO-1/2Bi2O3-CuO system contains four ternary phases and the SrO-CaO-1/2Bi2O3 system contains two new ternary phases.

00,470
PB93-166007 Not available NTIS
National Inst. of Standards and Technology (IMSE), Gaithersburg, MD.
Advanced Ceramics Standards Development.
Final rept.
S. Schneider. 1989, 5p.
Pub. in Euro-Ceramics, v3 p3.71-3.75 1989.

Keywords: *Ceramics, *Standards, *Classifications, Forecasting, Marketing, Comparison, Materials tests, Standard industrial classification, Reprints, *Advanced materials.

Advanced ceramics, because of their unique properties, are being extensively researched, developed and brought to market as rapidly as possible. Currently there are no associated consensus standards that allow national or international comparisons and this lack represents one of the more important technical unknowns in the commercial market equation. While the needs are diverse and product specific, there is a singular need for a unified classification system as it sets the basis for unanimity in information transfer and coherent standards development. Advanced ceramics development is gaining momentum with independent efforts now underway in several countries. However, early international collaboration is needed before conflicting national standards emerge. This paper presents a perspective on advanced ceramics standards needs, current activities and necessary future directions required for equivalence in data between groups and nations.

00,471
PB93-166015 Not available NTIS
National Inst. of Standards and Technology (IMSE), Gaithersburg, MD.
Advanced Ceramics: What's in a Name.
Final rept.
S. J. Schneider. 1989, 3p.
Pub. in ASTM (American Society for Testing and Materials) Standardization News, p28-30 Oct 89.

Keywords: *Ceramics, *Classifications, *Nomenclature, Terminology, Standards, Standard industrial classification, Reprints, *Advanced materials.

Advanced ceramics, being a newly recognized industry, has no accepted classification system in place to serve the interests of commercial product development and usage. It is required to set the basis for unanimity in information transfer between researchers, designers, manufacturers and product users. Further it is needed to provide the framework for product identity and promotion and to facilitate the process of international trade. To this end, beginning classification efforts now are underway internationally. The paper explores the issues and problems inherent in the development of a unified classification system for advanced ceramics.

00,472
PB93-166619 Not available NTIS

National Inst. of Standards and Technology (IMSE), Gaithersburg, MD.
Tensile Creep Testing of Structural Ceramics.
Final rept.
S. M. Wiederhorn. 1989, 3p.
See also PB91-159277.
Pub. in Ceram. Technol. Newsl. 25, p3-5 Oct-Dec 89.

Keywords: *Ceramics, *Creep tests, Loads(Forces), Mechanical properties, Tension tests, Test methods, Deformation, Strains, Fractures(Materials), Mechanical tests, Reprints.

A technique for measuring tensile creep deformation of ceramic materials up to temperatures of 1500 C has been developed. The tensile creep apparatus was based upon a pin and clevis arrangement that was used to attach a flat dogbone-shaped specimen to the load train. Good alignment was obtained in the tensile specimen through careful machining and tapering of the specimen holes. Creep deformation is measured continuously using a non-contacting strain measurement system. The system used a laser extensometer and a set of alpha silicon carbide flags attached to the gauge section of the specimen. Further details of this equipment can be obtained from an article by Carroll et al in the Journal of the American Ceramic Society, Volume 72, pp. 1610-1614.

00,473
PB93-166650 Not available NTIS
National Inst. of Standards and Technology (IMSE), Gaithersburg, MD. Ceramics Div.
Standard X-ray Diffraction Powder Patterns of Fourteen Ceramic Phases.
Final rept.
W. Wong-Ng, H. F. McMurdie, B. Paretzkin, M. A. Kuchinski, and A. L. Dragoo. 1989, 15p.
See also PB90-206160, PB90-206178 and PB90-206186. Sponsored by JCPDS-International Centre for Diffraction Data, Swarthmore, PA.
Pub. in Powder Diffraction 4, n1 p40-54 Mar 89.

Keywords: *X-ray diffraction, *Ceramics, *Standards, Crystal structure, Superconductors, Reprints, Powder patterns.

Fourteen reference patterns of oxide ceramics are reported. Included in the fourteen reference patterns are data for nine high critical temperature superconducting oxide related phases.

00,474
PB93-173508 PC A10/MF A03
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Ceramics Technical Activities, 1992 (NAS-NRC Assessment Panel May 13-14, 1993).
S. W. Freiman, and S. J. Dapkunas. May 93, 222p, NISTIR-4964.

Keywords: *Research projects, *Ceramics, Mechanical properties, Surface properties, Lubricants, Tribology, Wear, Microstructure, Composite materials, Glass, Electronics, Superconductors, Thin films, Standards, Powder(Particles), *National Institute of Standards and Technology, *Advanced materials, Structural Ceramics Database, High temperature superconductors, Ferroelectric oxide films, Diamond films.

In 1992 the Ceramics Division continued to develop a technical program which addresses the needs of U.S. industry. The program is made up of tasks involving standard materials development, construction of evaluated databases, and laboratory research focused on topics relevant to the dominant issues affecting commercialization of advanced ceramics, e.g., processing costs and reliability. Some areas of research were; data activities; powder characterization; surface properties; mechanical properties; electronic materials; optical materials; and materials microstructure characterization.

00,475
PB94-108552 (Order as PB94-108529, PC A08/MF A02)
National Inst. of Standards and Technology, Gaithersburg, MD.
Phase Equilibria and Crystal Chemistry In Portions of the System SrO-CaO-Bi2O3-CuO. Part 4. The System CaO-Bi2O3-CuO.
B. P. Burton, C. J. Rawn, R. S. Roth, and N. M. Hwang. 1993, 48p.
Prepared in cooperation with Korea Standards Research Inst., Tae-jon (Republic of Korea).
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n4 p469-516 Jul/Aug 93.

Keywords: *Calcium oxides, *Bismuth oxides, *Copper oxides, *Crystal chemistry, X-ray diffraction, BSCCO superconductors, Crystal structure, High temperature superconductors, Cuprates, Calcium bismuth copper oxides, Phase equilibrium.

New data are presented on the phase equilibria and crystal chemistry of the binary systems CaO-Bi2O3 and CaO-CuO and the ternary CaO-Bi2O3-CuO. Symmetry data and unit cell dimensions based on single crystal and powder x-ray diffraction measurements are reported for several of the binary CaO-Bi2O3 phases, including corrected compositions for Ca4Bi6O13 and Ca2Bi2O5. The ternary system contains no new ternary phases which can be formed in air at approximately 700-900 degrees C.

Coatings, Colorants, & Finishes

00,476
PB93-173474 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Quality Control Tests for Adhesion of Paint on the Panels of Tactical Rigid Wall Shelters, Phase 2.
M. E. McKnight, and J. F. Seiler. Mar 93, 32p, NISTIR-4958.
See also PB90-219825. Sponsored by Army Natick Research Development and Engineering Center, MA.

Keywords: *Adhesion, *Quality control, *Military facilities, *Test methods, *Paints, Aluminum, Shelters, Sandwich panels, Bond strength, Structural forms, Framed structures.

At the request of the U.S. Army Natick Research, Development and Engineering Center, a practical method was developed for measuring the adhesion of paints applied to shelters. As recommended in the Phase I report, a pull-off test based on the use of a commercially available pneumatic testing device was chosen. The procedure includes ways of controlling the substrate stiffness, a parameter that affects the test results, and a process for obtaining acceptable levels of adhesion for a particular substrate. The estimated precision (standard deviation) of the method is 9 percent. In a pilot study to determine the extent to which small differences in surface preparation would affect differences in pull-off test results, it was found that, at least for aluminum, the procedure was insensitive to small differences in surface preparation.

Composite Materials

00,477
DE93016669 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Failure Models In Continuous Fiber Ceramic Composites: Phase 1, Task 1, State of the Art Survey. Continuous Fiber Ceramic Composites Program, Task 2, Supporting Technologies.
C. P. Ostertag. 1991, 37p, DOE/OR/22014-1.
Contracts AI05-92OR22014, AC05-84OR21400
Sponsored by Department of Energy, Washington, DC.

Keywords: *Reinforced Materials, *Composite Materials, Crack Propagation, Cracks, Damage, Failure Mode Analysis, Fibers, Fracture Properties, Kinetics, Matrix Materials, Reviews, EDB/360603.

The high toughness of continuous fiber reinforced composites (CFCCs) is due to increasing the toughness by one or more of the following mechanisms: crack deflection, crack branching, crack bridging, microcracking, or fiber pullout. Most of the toughness, however, is attributed to work required to elastically elongate the bridging fibers and to pull the broken fibers out of the matrix. Understanding of matrix cracking mechanisms is important to the use of CFCCs. This survey concentrates on matrix cracking models established thus far that are based on continuous fiber-reinforced ceramic matrix composites with respect to both matrix crack initiation and matrix crack propagation. A review of experimental results relating material properties to the failure characteristics is included. 75 refs, 4 figs.

00,478
N93-14747/8 (Order as N93-14744/5, PC A09/MF A02)
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Flow Behavior In Liquid Molding.
D. Hunston, F. Phelan, and R. Pamas. Oct 92, 20p.
In NASA. Langley Research Center, FIBER-TEX 1991: The Fifth Conference on Advanced Engineering Fibers and Textile Structures for Composites p 23-42.

Keywords: *Fabrication, *Flow characteristics, *Injection molding, *Manufacturing, *Polymer matrix composites, *Resin transfer molding, Process control (Industry), Resin matrix composites, Curing, On-line systems, Permeability, Thermal conductivity.

The liquid molding (LM) process for manufacturing polymer composites with structural properties has the potential to significantly lower fabrication costs and increase production rates. LM includes both resin transfer molding and structural reaction injection molding. To achieve this potential, however, the underlying science base must be improved to facilitate effective process optimization and implementation of on-line process control. The National Institute of Standards and Technology (NIST) has a major program in LM that includes materials characterization, process simulation models, on-line process monitoring and control, and the fabrication of test specimens. The results of this program are applied to real parts through cooperative projects with industry. The key feature in the effort is a comprehensive and integrated approach to the processing science aspects of LM. This paper briefly outlines the NIST program and uses several examples to illustrate the work.

00,479
PB93-153500 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Metallurgy Div.
Mechanical Test Methods for Metal-Matrix Composites: A Status Report from the U.S.A.
Final rept.
L. Mordfin. 1992, 6p.
Pub. in Proceedings of International Conference on Aluminum Alloys (3rd), Trondheim, Norway, June 22-26, 1992, p465-470.

Keywords: *Metal matrix composites, *Composite materials, *Mechanical tests, Industrial plants, United States, Standards, Mechanical properties, Performance evaluation, Reprints.

The widespread adoption of metal-matrix composite (MMC) materials for industrial applications has been impeded by the absence of a reliable database of the mechanical properties of the materials. A prerequisite to the establishment of a database are standard test methods, few of which exist for MMCs. This paper reviews some of the ongoing efforts to develop standard mechanical test methods for MMCs in ASTM, the Society of Automotive Engineers, the Department of Defense, the National Institute of Standards and Technology, and elsewhere in the United States. It is shown that the deficiency is especially great for particulate-reinforced MMCs which, with reliable property data, could well find profitable uses in many civilian applications.

00,480
PB93-153765 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Wear and Friction Characteristics of Self-Lubricating Copper - Intercalated Graphite Composites.
Final rept.
A. W. Ruff, M. B. Peterson, A. Gangopadhyay, and E. Whitenton. 1989, 6p.
Contract FY1457-89-N-5021
Sponsored by Air Force Materials Lab., Wright-Patterson AFB, OH.
Pub. In Proceedings of International Congress on Tribology (5th), Helsinki, Finland, June 12-15, 1989, p259-264.

Keywords: *Metal matrix composites, *Friction, *Wear tests, Stainless steels, Copper, Interfaces, Composite materials, Graphite, Tribology, Wear, Mathematical models, Reprints.

Composite materials consisting of copper metal-matrices with a solid lubricant phase of intercalated graphite have been prepared and studied in sliding wear against type 440C stainless steel at normal tempera-

tures in air. Results on the controlling wear and friction mechanisms in these materials are presented. Beneficial effects were found up to about 15 volume percent intercalated graphite. An analytical model has been developed that relates composite wear to mechanical and tribological properties of the different solid phases in the composite and the interface film.

Fibers & Textiles

00,481
AD-A258 836/6 PC A03/MF A01
National Bureau of Standards (NEL), Gaithersburg, MD. Center for Fire Research.
Burn Injury Potential of Navy Shipboard Work Clothing.
Final technical rept. Jan-Sep 81.
J. F. Krasny, P. J. Allen, and A. Maldonado. Feb 83, 43p, NCTRF-TR-146.
Contract 80-M-0317

Keywords: *Clothing, *Burns(injuries), *Fire resistance, *Naval personnel, *Fire resistant textiles, Cotton, Polyester fibers, Heat tolerance, Fabrics, Fibers, Flames, Heat flux, Impingement, Ignition, Materials, Nylon, Combustion, Polyamide plastics, Protection, Temperature, Test and evaluation, Underwear, Visual inspection, Wounds and injuries, *Occupational safety and health, Wools, Nomex, Heat protection, Shipboard work clothing, Flame exposure.

Shipboard work/utility clothing was evaluated to determine the potential of standard clothing (officer and enlisted personnel) for burn injury. Sixteen fabrics made from cotton, polyester, wool, and blends of these fibers and of nylon/cotton were used in shipboard clothing and were heat tested along with two fire-retardant (FR) materials of Nomex/Kevlar and 100-percent FR-treated cotton (THPOH-NH3) and four underwear materials of cotton and polyester cotton. Materials were subjected to radiant heat exposures of 0.2 to 0.6 g cal/cm sec. The FR materials were also impinged by flame. Time to burn injury (TBI) values were established for all tested fabrics using the Stoll-Derksen curve with the measuring calorimeter in contact and 1/2 inch from the specimens. For the flame impingement tests the flame temperature was 2000 deg F and the TBI and total heat values were measured 1/8 inch from the fabrics. Experimental methods were established which could differentiate between heat protection assemblies exposed to modest and high heat exposure. Data were obtained for TBI and total heat (TH) transmitted. Visual inspection of the material was also noted. Results showed that, at radiant heat flux levels of 0.2 g cal/cm2/sec, protection was related to fabric weight and not fiber type. At higher heat exposures, the type of fiber used becomes significant, with thermoplastic fibers providing the least protection. Data on the Nomex/Kevlar and FR cotton fabrics showed that the aramids were superior to the FR cotton at the higher flux values of 0.6 g cal/cm2/sec, but neither would provide reliable protection from jet fuel fires for more than a few seconds.

00,482
PB93-139095 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Factory Automation Systems Div.
Information Technology Vision for the U.S. Fiber/Textile/Apparel Industry.
Interim rept.
H. T. Moncarz. Nov 92, 35p, NISTIR-4986.
Contracts DLA-91-R, DLA-D-8
Sponsored by Defense Logistics Agency, Alexandria, VA. Mfg. Engineering Branch.

Keywords: *Textile industry, *Clothing industry, *Technology utilization, Computer aided manufacturing, Computer aided design, Product development, Competition, Industrial development, *Information technology, Concurrent engineering, National Institute of Standards and Technology.

The fiber/textile/apparel (FTA) industry is one of America's largest manufacturing industries, and its success is critical to the economic well-being of the country. In terms of technology, the industry is very sophisticated, and in fact, each of its three sectors is the most productive in the world. However, the industry has been challenged by an onslaught of imported products. The most serious economic threat of foreign competition is to the apparel sector, which is the least capital intensive of the three industry sectors. While steps to address the challenges to the FTA industry include technological, sociological, and economic efforts, the paper focuses on efforts employing information technology. The nationwide capacity must be created that can enable and sustain the production of world class FTA products that are reasonably priced and are responsive to consumer demands. An enterprise framework, product data standards, and improved design practices are the information technologies that will enable the required system to be developed. In turn, these technologies will assist in the implementation of design-driven, multi-enterprise, concurrent engineering as well as demand-activated manufacturing.

Iron & Iron Alloys

00,483
PB93-153310 Not available NTIS
National Inst. of Standards and Technology (MSEL), Boulder, CO. Materials Reliability Div.
Magnetic Properties of Cr-Mn Austenitic Stainless Steels.
Final rept.
M. Foldeaki, H. Ledbetter, and P. Uggowitzer. 1992, 12p.
Pub. in Jnl. of Magnetism and Magnetic Materials 110, p185-196 1992.

Keywords: *Austenitic stainless steels, *Magnetic properties, *Thermomagnetic effects, Chromium steels, Manganese alloys, Mechanical properties, Deformation, Ferromagnetism, Heat treatment, Magnetic moments, Reprints.

The magnetic susceptibility of three Cr-Mn austenitic stainless steels was measured as a function of temperature in the range 5-400 K. All specimens showed a characteristic susceptibility maximum. The temperature of the maximum and especially the curve shape depend strongly on specimen composition and metallurgical conditions (as-quenched, deformed). Because no significant field dependence appeared, the susceptibility maximum was identified as the antiferromagnetic Neel temperature. Magnetic susceptibility measurements above TN were fitted to a modified Curie-Weiss equation. Comparison between measurements and generalized-molecular-field-theory predictions allowed us to identify the magnetic structure as that of a first-type antiferromagnet with fcc crystal structure. The atomic magnetic moment and the molecular-field coefficients depend strongly not only on composition, but also on metallurgical prehistory, that is, on the degree of the applied mechanical deformation and heat treatment. Mainly, manganese affected the antiferromagnetic interactions, while chromium affected the ferromagnetic. Mn and Fe contributed the most to the effective atomic moment. Measurements on mechanically deformed specimens show a structure sensitivity of the molecular-field constants. This could be interpreted consistently in terms of lattice-parameter changes. The apparent structure sensitivity of the effective atomic moment can be attributed to changes in matrix composition caused by precipitation.

00,484
PB93-153427 Not available NTIS
National Inst. of Standards and Technology (MSEL), Boulder, CO. Materials Reliability Div.
WRC-1992 Constitution Diagram for Stainless Steel Weld Metals: A Modification of the WRC-1988 Diagram.
Final rept.
D. J. Kotecki, and T. A. Siewert. 1992, 8p.
Pub. in Welding Research Supplement, p171-s-178-s May 92.

Keywords: *Stainless steels, *Weld metal, *Phase diagrams, Welded joints, Standards, Welding, Filler metal, Ferritic stainless steels, Weldments, Reprints, Schaeffler diagram.

To increase the scope and accuracy of Ferrite Number (FN) prediction in stainless steel weld metal and related dissimilar metal joints, a modification of the Welding Research Council 1988 diagram (WRC-1988 diagram) is proposed. The proposed WRC-1992 diagram includes a coefficient for Cu in the Ni equivalent, thereby removing a tendency for the WRC-1988 diagram to overestimate the FN of weld metals when the Cu content is high. Also, the axes of the WRC-1992 diagram can be extended (as in the Schaeffler diagram) to predict dilution effects in dissimilar metal joints.

00,485
PB93-182020 PC A03/MF A01
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Metallurgy Div.
Mechanical, Stress-Rupture, and Fracture Toughness Properties of Normalized and Stress Relieved AAR TC128 Grade B Steel at Elevated Temperatures.
G. E. Hicho. 1993, 48p, NISTIR-5157, REPT-26.
Sponsored by Federal Railroad Administration, Washington, DC. Safety Research Div.

Keywords: *Steels, *Tank cars, *Fracture strength, Fracture tests, Mechanical properties, Toughness, Thermal stresses, Creep rupture strength, Fracture properties, Yield strength.

The mechanical, fracture toughness, and stress-rupture properties of a normalized and stress relieved tank car steel were found to be reduced by increased temperature and time at temperature. The effects of loading rates, 0.0127 and 0.127 cm/min, on these properties were also evaluated. Most affected was the yield strength, where at the loading rate of 0.127 cm/min, the yield strength as a function of temperature and time at temperature was greater than that obtained under similar test conditions at a loading rate of 0.0127 cm/min. The ultimate and yield strength were observed to decrease continuously from 593 C to 677 C for time of 60, 90, and 120 minutes. The ductility, in terms of the elongation and reduction-of-area were found to increase over these same test temperatures and times. The fracture toughness, because of the yield strength decrease as the temperature increased, decreased as the test temperature increased. Fracture toughness tests found the steel to be highly resistant to unstable fracture, and stress-rupture tests revealed that the rupture lifetime could be extended, at elevated temperatures, by reducing the maximum internal pressure of the tank car.

00,486
PB93-219731 PC A03/MF A01
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Metallurgy Div.
Fracture Mechanics Evaluation of Railroad Tank Cars Containing Postulated Circumferential Cracks.
G. E. Hicho, A. Zahoor, R. J. Fields, and R. deWit. Apr 93, 26p, NISTIR-5179, REPT-27.

Keywords: *Tank cars, *Cracking(Fracturing), *Steel AAR-TC128, Fracture properties, Hazardous materials transportation, Fracture tests.

Fracture mechanics analyses using the J-integral as fracture parameter were performed for railroad tank cars made from normalized AAR TC128 grade B steel. Circumferential through-wall cracks in the tank car shell region were postulated to determine the critical crack size for axial tension loadings anticipated in service. Five loading cases were considered. These were: (1) coupler impact, (2) test pressure, (3) start-to-discharge pressure, (4) bursting pressure, and (5) vapor tight minimum pressure. The analyses were performed for two service temperatures, -40 deg. C (-40 deg. F) and 22 Deg. C (72 deg. F).

00,487
PB93-234706 PC A04/MF A01
National Inst. of Standards and Technology (MSEL), Boulder, CO. Materials Reliability Div.
Structure-Property Relationships in Microalloyed Ferrite-Pearlite Steels Phase 1: Literature Review, Research Plan, and Initial Results.
P. T. Purtscher, and Y. W. Cheng. Jul 93, 63p, NISTIR-3992.

Keywords: *Steels, *Forgings, *Alloying, Microstructure, Carbon steels, Toughness, Grain refinement, Tension tests, Crankshafts.

The literature related to the relationship between micro-structure and properties of steels after thermomechanical processing is reviewed and a plan for research is outlined. The goal is to provide a methodology which can predict the range of forging parameters that will produce acceptable properties in the as-forged condition. The first phase of the work will emphasize the micro-alloyed ferrite-pearlite steels used to replace quenched and tempered steels in forged automotive applications such as crank-shafts and connecting rods.

Miscellaneous Materials

00,488
DE93012534 PC A03/MF A01
National Inst. of Standards and Technology, Boulder, CO. Center for Chemical Technology.
Apparent Thermal Conductivity of Polyurethane Foam Insulation, Containing Various HCFC Blends, from 125 to 335 K. (Final report).
Progress rept.
D. R. Smith. 1993, 45p, DOE/OR/21428-T1.
Contract Ai05-84OR21428
Sponsored by Department of Energy, Washington, DC.
Portions of this document are illegible in microfiche products.

Keywords: *Plastic Foams, *Polyurethanes, *Thermal Insulation, *Aging, Correlations, Fillers, Gases, Progress Report, Temperature Dependence, Temperature Range 0065-0273 K, Temperature Range 0273-0400 K, Thermal Conductivity, EDB/360606, EDB/320107.

The specimens contain several different blends of HCFC 123 and HCFC 141b as fill gases. Effects of thickness on conductivity and, indirectly, on aging were studied by repeating measurements of conductivity of one specimen whose thickness was reduced in 6-mm steps from 25 to 6 mm. The effect of aging was directly studied by repeating conductivity measurements, after a lapse of time, on two different specimens. The conductivities of all specimens rise linearly with temperature over the lowest (125 to 220 K) and the highest (280 to 335 K) range of temperature, but pass through a local maximum at about 225 K and a local minimum at about 2735 K. The slopes of the two linear portions are approximately equal. For all specimens the conductivity functions below the local maximum practically coincide. The position of the local minimum is independent of fill gas species or mixture, while the location and height of the local maximum depends on fill gas species and on effects of aging. Functional relationships between the conductivity and temperature are obtained for each specimen in the form of ratios of cubic polynomials, the simplest form that accurately models the temperature dependence of conductivity over the whole range studied.

00,489
DE93014767 PC A03/MF A01
Air-Conditioning and Refrigeration Technology Inst., inc. Arlington, VA.
Theoretical Evaluation of R22 and R502 Alternatives. Final Report.
Progress rept.
P. A. Domanski, and D. A. Didion. Jan 93, 26p, DOE/CE/23810-7.
Contract FG02-91CE23810
Sponsored by Department of Energy, Washington, DC.

Keywords: *Refrigerants, *Thermodynamic Properties, Heat Pumps, Material Substitution, Mixtures, Progress Report, EDB/320107, EDB/360600.

The study was conducted using a semi-theoretical model, CYCLE-11, with a pure cross-flow representation of heat transfer in the evaporator and condenser. The Camahan-Starling-DeSantis equation of state was used for calculating thermodynamic properties. Transport properties were not involved in the simulations. Simulations were conducted for "drop-in" performance, for performance in a modified system to assess the fluids' potentials, and for performance in a modified system equipped with a liquid-line/suction-line heat exchanger. The results - presented on a relative basis to R22 and R502 performance - include the volumetric capacity, coefficient of performance, pressure increase across the compressor, and compressor discharge pressure and temperature.

00,490
DE93040219 PC A11/MF A03
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Thermophysics Div.
Thermophysical Properties. Progress Report, 1 January 1992--31 March 1993.
R. F. Kayser. Apr 93, 237p, DOE/CE/23810-16.
Contract FG02-91CE23810
Sponsored by Department of Energy, Washington, DC.

Keywords: *Refrigerants, Density, Fluorinated Aliphatic Hydrocarbons, Mathematical Models, Mixtures, Progress Report, Specific Heat, Temperature Dependence, Thermal Conductivity, Thermodynamic Properties, Viscosity, *Thermophysical properties, EDB/360606, EDB/320107.

Numerous fluids have been identified as promising alternative refrigerants, but much of the information needed to predict their behavior as pure fluids and as components in mixtures does not exist. in particular, reliable thermophysical properties data and models are needed to predict the performance of the new refrigerants in heating and cooling equipment and to design and optimize equipment to be reliable and energy efficient. The objective of this fifteen-month project has been to provide highly accurate, selected thermophysical properties data for Refrigerants 32, 123, 124, and 125, and to use these data to fit equations of state and transport property models. The new data have filled gaps in the existing data sets and resolved problems and uncertainties that existed in and between the data sets.

00,491
PB93-151157 Not available NTIS
National inst. of Standards and Technology (BFRL), Gaithersburg, MD. Building Environment Div.
Comparison of Experimental Measurements of Local Flow Boiling Heat Transfer Coefficients for R11 and R123.
Final rept.
M. A. Kedzierski, and D. A. Didion. 1991, 8p.
Sponsored by Electric Power Research inst., Palo Alto, CA.
Pub. in Proceedings of ASME/JSME Thermal Engineering Conference, Reno, NV., March 17-22, 1991, v3 p243-250.

Keywords: *Refrigerants, *Heat transfer coefficient, *Boiling, Transport properties, Thermodynamic properties, Heat flux, Reynolds number, Heat transmission, Heat transfer, Comparison, Reprints, *R11, *R123.

The paper presents a comparison of the measured horizontal, smooth-tube, flow boiling heat transfer coefficient of R11 to that of its proposed ozone safe replacement, R123. The fluid properties of R11 and R123 are similar. The flow boiling data for the two fluids are similar for the convective region. However, the heat transfer coefficient for R11 in the nucleate flow boiling region was consistently observed to be, on average, 8.5% to 33% larger than that for R123. The influence of Reynolds number and heat flux on the heat transfer-thermodynamic quality relationship is also presented. Predictions of the heat transfer coefficient with two open literature flow boiling correlations were compared to the measured data. The heat transfer coefficients predicted with the correlations were, on average, from 13% to 57% greater than the measured heat transfer coefficients.

00,492
PB93-166593 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Thermophysics Div.
Critical Parameters and Saturation Densities of 1,1-Dichloro-2,2,2-Trifluoroethane.
Final rept.
L. A. Weber, and J. M. H. Levelt Sengers. 1990, 9p.
Pub. in Fluid Phase Equilibria 55, n1-2 p241-249 1990.

Keywords: *Critical point, *Density(Mass/volume), *Fluorohydrocarbons, Liquid phases, Critical temperature, Critical density, Vapor phases, Phase studies, Refrigerants, Reprints, *Ethane/dichloro-trifluoro, *Freon 123.

An optical cell has been used to determine the critical parameters, T(sub c) and Rho(sub c), and densities along the liquid-vapor phase boundary of 1,1-dichloro-2,2,2-trifluoroethane (Refrigerant 123). The critical temperature was found to be 456.94 K and the critical density is 550 kg/cu m. Measurement temperatures varied from 298 K to the critical point for the saturated liquid and from 433 K to the critical point for saturated vapor.

00,493
PB93-178598 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Horizontal Nucleate Flow Boiling Heat Transfer Coefficient Measurements and Visual Observations for R12, R134a, and R134a/Ester Lubricant Mixtures.
M. A. Kedzierski, and M. P. Kaul. Mar 93, 34p, NISTIR-5144.
See also PB93-120756. Sponsored by Department of Energy, Washington, DC. Office of Conservation and Renewable Energy.

Keywords: *Refrigerants, *Air pollution abatement, *Environmental chemical substitutes, *Nucleate boiling, Heat transfer, Lubricants, Mixtures, Fluorohydrocarbons, Freons, Visual inspection, Esters, Heat exchangers, Performance evaluation, R-12, R-134a, Ethane/tetrafluoro, Dichlorodifluoromethane.

The paper presents a calorimetric and visual investigation of horizontal nucleate flow boiling of five different fluids: (1) dichlorodifluoromethane (R12), (2) 1,1,1,2-tetrafluoroethane (R134a), (3) R134a/1.7% proprietary polyol ester lubricant, (4) R134a/0.9% neopentyie polyol ester lubricant, and (5) R134a/2.3% neopentyle polyol ester lubricant. The calorimetric aspect of the study concentrates on the measurement of the local two-phase heat transfer coefficient (h(sub 2 phi)). The visual measurements obtained from high-speed 16 mm film of the boiling were taken simultaneously with the calorimetric measurements. The bubble diameters (D(sub b)), and the bubbie density were derived from over 50 high-speed films. The purpose of the study is to provide a source of heat transfer information for the boiling of R12 and R134a/ester lubricant mixtures. Automotive and supermarket companies have begun to manufacture original air conditioning/refrigeration equipment with R134a as the operating fluid. The evaporator predominantly utilized by these industries is the in-tube heat exchanger. Naturally, designers of such evaporators require heat transfer coefficients for the horizontal flow boiling of R134a/ester mixtures. Only the nucleate flow boiling regime was investigated in the study with the aim of furthering the understanding of the fundamental heat transfer mechanisms responsible for the phenomenon.

Nonferrous Metals & Alloys

00,494
AD-A261 751/2 PC A10/MF A03
National Inst. of Standards and Technology (iMSE), Gaithersburg, MD. Metallurgy Div.
Solidification Processing and Phase Transformations in Ordered High Temperature Alloys.
Final rept. 30 Mar 90-30 Sep 92.
W. J. Boettinger, L. A. Bendersky, and U. R. Kattner. 20 Jan 93, 205p.
Contract DARPA ORDER-7469

Keywords: *Phase transformations, *Solidification, *Metal crystals, *Crystallography, *Heat resistant alloys, *Nickel alloys, *Fiber reinforced composites, Alloys, Cooling, Creep strength, Heat treatment, High temperature, Metallurgy, Phase diagrams, Temperature, Toughness, Strength(Mechanics), Annealing, Hot pressing, Isostatic pressing, Microstructure, Titanium alloys, Aluminum, Niobium, Molybdenum alloys, Intermetallic compounds, Powder metallurgy, Intermetallic alloys, Molybdenum disilicide, Hot isostatic pressing.

Useful high temperature alloys generally have microstructures consisting of more than one phase. Multiphase microstructures are necessary to develop acceptable toughness and creep strength in high temperature intermetallic alloy matrices. The optimum microstructures must be developed by a careful selection of processing path that includes both solidification and solid state heat treatment. Research has been conducted on the rapid solidification of selected intermetallic alloys and on the phase transformation paths that occur during cooling, primarily in the Ti-Al-Nb system. This report describes research performed in the Metallurgy Division at NIST under DARPA order 7469 between 1/1/89 and 12/31/92. Various research tasks were completed and the results have been published or have been submitted for publication.

00,495
N94-10178/9 (Order as N94-10171/4, PC A20/MF A04)
National Inst. of Standards and Technology, Gaithersburg, MD.
Effect of Gravitational Modulation on Convection in Vertical Bridgman Growth.
B. T. Murray, S. R. Coriell, G. B. Mcfadden, and A. A. Wheeler. cAug 92, 4p.
in Esa, Proceedings of the 8TH European Symposium on Materials and Fluid Sciences in Microgravity, Volume 2 p 503-506. Sponsored by NASA, Washington.

Keywords: *Bridgman method, *Directional soildification (Crystals), *Free convection, Floquet theorem,

Gravitational effects, Solutes, Boundary conditions, Flow stability, Schmidt number, Vibration, Binary alloys.

During vertical directional solidification of a binary alloy at constant velocity, buoyancy driven solutal convection may occur due to the solute gradient associated with the solidification process. This problem is further complicated if time periodic forcing is considered, which is relevant to materials processing in a microgravity environment or as a means of dynamic control of flow instabilities. The effect of time periodic modulation is studied by introducing a gravitational acceleration which is a sinusoidal function of time. The onset of solutal convection is treated by a stability analysis of the linearized governing equations and boundary conditions. Solutions are obtained numerically by employing two distinct computational implementations of Floquet theory. Results for materials with large Schmidt number are presented, and an analysis for large frequency and large Schmidt number yields a more complete description of the behavior in this relevant limit.

00,496
PB93-151603 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Development of Ore Bioleaching Standards.
Final rept.
G. J. Olson. 1989, 9p.
Pub. in Proceedings of International Symposium on Biohydrometallurgy, Jackson Hole, WY., August 13-18, 1989, p71-79.

Keywords: *Ore processing, *Leaching, *Pyrite, *Biological treatment, *Hydrometallurgy, Extractive metallurgy, Microorganisms, Substrates, Oxidation, Reaction kinetics, Reprints, *Standard reference materials, Thiobacillus ferrooxidans.

Discussion at past bioleaching conferences has indicated the need for standard procedures and test materials for improved intercomparison of data from pyrite and ore bioleaching tests. Many variables are associated with bioleaching rates and the availability of standards would provide a means for comparison of strains of microorganisms and ore substrates. Pyrite from South Carolina was tested as an initial candidate reference material in an earlier study. Three strains of Thiobacillus ferrooxidans were found to leach a 100-200 mesh fraction of the material in shake flasks at rates ranging from 1.7-2.2 mg Fe/l/hr with relative standard deviations of 7-11%. Inoculum size did not affect bioleaching rates at initial cell densities of 5,000,000 or higher. Baffled flasks did not increase pyrite oxidation rates. These and other data were incorporated into a pyrite leaching procedure. Recent efforts focused on pyrite obtained in bulk from the Waldo Mine in New Mexico. The leaching rate of this pyrite under varying conditions ranged from 3.08 to 13.2 mg Fe/l/hr with a strain of T. ferrooxidans (American Type Culture Collection no. 13661). The Waldo pyrite is being characterized for composition and will be available for distribution from the Office of Standard Reference Materials, National Institute of Standards and Technology.

00,497
PB93-151918 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Deformation Twinning, Slip, Martensite Formation and Crack Inhibition in the B2-Type Zr50Pd35Ru15 Alloy.
Final rept.
R. M. Waterstrat, L. A. Bendersky, and R. Kuentzler. 1992, 6p.
Sponsored by American Dental Association Health Foundation, Chicago, IL.
Pub. in Proceedings of Shape-Memory Materials and Phenomena - Fundamental Aspects and Applications Symposium, Boston, MA., December 3-5, 1991, p115-120 1992.

Keywords: *Biological materials, *Zirconium alloys, *Fracture properties, Deformation, Twinning, Crystal structure, Martensite, Intermetallic compounds, Ruthenium alloys, Palladium alloys, Crack propagation, Dental materials, Mechanical properties, Reprints.

Enhanced room temperature toughness of the Zr50Pd35Ru15B2 phase alloy was found to be a result of the activation of an additional deformation mode besides the b=(001) dislocation slip mode - (114)-type mechanical twinning. The twinning is a true one, i.e., there is no change in the ordered crystal structure. Another additional mode of plastic deformation, expected for more Pd rich alloys, is the formation of stress-induced martensite. The martensite was found to have a CrB-type structure.

00,498
PB93-151934 Not available NTIS
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Applied and Computational Mathematics Div.
Phase-Field Model for Isothermal Phase Transitions in Binary Alloys.
Final rept.
A. A. Wheeler, W. J. Boettinger, and G. B. McFadden. 1992, 16p.
See also PB92-108992.
Pub. in Physical Review A 45, n10 p7424-7439, 15 May 92.

Keywords: *Binary alloys, *Phase transformations, *Mathematical models, Interfaces, Separation, Alloying, Asymptotic methods, Binary systems(Materials), Thermal analysis, Isothermal treatment, Reprints.

In the paper we present a phase-field model to describe isothermal phase transitions between ideal binary-alloy liquid and solid phases. Governing equations are developed for the temporal and spatial variation of the phase field, which identifies the local state or phase, and for the composition. An asymptotic analysis as the gradient energy coefficient of the phase field becomes small shows that our model recovers classical sharp interface models of alloy solidification when the interfacial layers are thin, and we relate the parameters appearing in the phase-field model to material and growth parameters in real systems. We identify three stages of temporal evolution for the governing equations: the first corresponds to interfacial genesis, which occurs very rapidly; the second to interfacial motion controlled by diffusion and the local energy difference across the interface; the last takes place on a long time scale in which curvature effects are important, and corresponds to Ostwald ripening. We also present results of numerical calculations.

00,499
PB93-166080 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Metallurgy Div.
High Temperature X-ray Diffractometry of Ti-Al Alloys.
Final rept.
R. D. Shull, and J. Cline. 1990, 23p.
Pub. in High Temperature Science 26, p95-117 1990.

Keywords: *Aluminum alloys, *Titanium alloys, X-ray diffraction, High temperature, Debye-Waller factor, Lattice parameters, Phase transformations, Phase diagrams, Reprints, Titanium aluminides.

High temperature X-ray diffraction, an established technique for high temperature materials characterization, has been applied to the titanium-aluminum system in order to obtain structural information on the material at elevated temperatures. In situ X-ray diffraction data for a titanium-45 atomic percent aluminum alloy clearly showed the disappearance of the ordered Ti3Al structure on heating to 1300 C, but with the fundamental alpha-Ti diffraction peaks remaining. All diffraction peaks are indexed and prove the existence of the previously proposed Ti3Al + TiAl-> alpha-Ti eutectoid reaction near 1125 C in this alloy. No BCC beta-Ti phase was detected for this alloy up to 1400 C. High temperature X-ray diffraction measurements on a titanium-52 atomic percent aluminum alloy also showed no beta-Ti phase up to 1350 C. Debye Waller factor analysis of the gamma-TiAl phase diffraction peaks for Ti48Al52 also indicated the absence of any phase changes between 850-1250 C. The modified Ti-Al phase diagram presented here includes a shift in the gamma-phase transus lines to higher aluminum contents, the addition of a new alpha prime phase region, and the elimination of the beta + gamma phase field.

00,500
PB93-166601 Not available NTIS
National Inst. of Standards and Technology (IMSE), Gaithersburg, MD. Metallurgy Div.
Review of the Nickel-Graphite Interface.
Final rept.
N. S. Wheeler. 1990, 7p.
Pub. in Jnl. of Composites Technology and Research 12, n3 p177-183 1990.

Keywords: *Nickel, *Graphite, *Interfaces, *Surface chemistry, High temperature tests, Diffusion, Graphitization, Metal coatings, Reprints.

The literature on the nature of the high-temperature behavior of the nickel graphite interface is critically reviewed, and the problem is shown to be primarily due to the interdiffusion of carbon and nickel. The diffusion barriers that have been found to be the most effective in suppressing diffusion are those containing carbide-forming metals.

00,501
PB93-173441 PC A07/MF A02
National Inst. of Standards and Technology (MSEL), Boulder, CO. Materials Reliability Div.
Aluminum Alloys for ALS Cryogenic Tanks: Comparative Measurements of Cryogenic Mechanical Properties of Al-Li Alloys and Alloy 2219.
R. P. Reed, P. T. Purtscher, N. J. Simon, J. R. Berger, E. S. Drexler, R. L. Santoyo, J. D. McColskey, and R. P. Walsh. Feb 93, 147p, NISTIR-3979.
See also AD-A242 956. Sponsored by Astronautics Lab. (AFSC), Edwards AFB, CA.

Keywords: *Aluminum alloys, *Lithium alloys, *Cryogenics, Mechanical properties, Tensile properties, Toughness, Cracking(Fracturing), Ductility, Fractures(Materials), Stresses, Strains.

Tensile and fracture toughness were obtained at cryogenic temperatures to compare the Al-Li alloys 8090, 2090, and WL049, and alloy 2219 in various tempers and specimen orientations. The strongest alloy at very low temperatures is WL049-T851, which is about 10 percent stronger than 2090-T81. Both alloys are considerably stronger than 2219-T87. Alloy 2090-T81 is tougher (about 50 percent) than WL049-T851 at low temperatures; the higher toughness is attributed to the presence of fewer constituent particles and the tendency to delaminate at low temperatures. The delamination divides the moving crack, thus separating it into smaller regions where plane stress (rather than plane strain) conditions are conducive to increased toughness.

00,502
PB93-228633 PC A04/MF A01
National Inst. of Standards and Technology (MSEL), Boulder, CO. Materials Reliability Div.
Cryogenic Mechanical Testing of Al-Li Alloys at NIST.
P. T. Purtscher. Jul 93, 56p, NISTIR-5004.

Keywords: *Aluminum alloys, *Lithium, *Mechanical properties, *Cryogenics, Launch vehicles, Cracking(Fracturing), Fracture properties, NLS(National Launch System).

Work done in 1992 at NIST in support of the National Launch System (NLS) program consisted of two parts. The first part (Part A) was an evaluation of Al-Cu-Li-Mg-Ag-Zr alloys to determine whether recent developments in the relatively new alloy produced significant improvements in the tensile and fracture toughness. The results show that there is only a slight difference between the mechanical properties of the three variations of Al-Cu-Li-Mg-Ag-Zr alloys from room temperature down to liquid-helium temperature. The second part (Part B) of the program evaluated the effect of product form on the residual strength and mechanical behavior of Alloy 2090 between room and liquid-helium temperature. Three different product forms were included in the program: sheets, extrusions, and welds. At room temperature, sheets that exhibited delaminations on the fracture surface had the highest defect tolerance of the three product forms tested.

00,503
PB93-234748 PC A03/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD.
Boundary/Interface Fitted Grid Generation Using Tensor Product B-splines: A Preliminary Study.
B. V. Saunders. Aug 93, 21p, NISTIR-5239.

Keywords: *Liquid-solid interfaces, *Binary alloys, Bridgman method, Spline functions, Microstructure, Interpolation, Directional solidification, Grid generation.

Progress in the development of an algebraic grid generation system that tracks a solid-liquid interface during directional solidification of a binary alloy is discussed. A single mapping, constructed with tensor product B-splines, is proposed for calculations of both shallow

and deep solidification cells. The initial spline coefficients for the coordinate mapping are modified to minimize a discrete functional that regulates the smoothness and orthogonality of the mesh. The use of transfinite blending function interpolation to obtain an initial grid is examined.

Plastics

00,504
PB93-153542 Not available NTIS
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD. Fire Measurement and Research Div.
Molecular Modeling of Polymer Flammability: Application to the Design of Flame-Resistant Polyethylene.
Final rept.
M. R. Nyden, G. P. Fomey, and J. E. Brown. 1992, 9p.
Pub. In Macromolecules 25, n6 p1658-1666, 16 Mar 92.

Keywords: *Flammability, *Polyethylene, *Mathematical models, Thermal degradation, Polymers, Fire resistant materials, Molecular structure, Charring, Simulation, Flammability tests, Combustion products, Crosslinking, Reprints.

Molecular dynamic simulations of the thermal degradation of polyethylene were used to identify factors which might be effective in reducing polymer flammability by promoting the formation of a residual char. Computer movies of the calculated trajectories indicate that cross-linked polymers, such as those obtained from exposure of polyethylene to ionizing radiation, will undergo further cross-linking when burned, eventually forming a high molecular weight, thermally stable char. This prediction was confirmed in flammability tests of gamma-ray-irradiated polyethylene.

Wood & Paper Products

00,505
PB93-153435 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Fire Science and Engineering Div.
Heat and Mass Transport from Thermally Degrading Thin Cellulosic Materials in a Microgravity Environment.
Final rept.
G. Kushida, H. R. Baum, T. Kashiwagi, and C. di Blasi. 1992, 9p.
Pub. in Jnl. of Heat Transfer 114, p494-502 May 92.

Keywords: *Reduced gravity, *Cellulose, *Heat transfer, *Mass transfer, Thermal degradation, Oxidation, Vortices, Pyrolysis, Transport properties, Reynolds number, Slip flow, Chemical reactions, Combustion, Reprints.

A theoretical model describing the behavior of a thermally thin cellulosic sheet heated by external thermal radiation in a quiescent microgravity environment is developed. This model describes thermal and oxidative degradation of the sheet and the heat and mass transfer of evolved degradation products from the heated cellulosic surface into the gas phase. At present, gas phase oxidation reactions are not included. Without buoyancy, the dominant vorticity creation mechanism in the bulk of the gas is absent except at the material surface by the requirement of the no-slip condition. The no-slip condition is relaxed, permitting the flow to be represented by a velocity potential. This approximation is permissible due to the combination of a microgravity environment and low Reynolds number associated with slow small-area heating by external radiation. Two calculations are carried out: heating without thermal degradation, and heating with thermal degradation of the sheet with endothermic pyrolysis, exothermic thermal oxidative degradation, and highly exothermic char oxidation. The results show that pyrolysis is the main degradation reaction. Moreover, self-sustained propagation of smoldering for cellulosic materials is very difficult due to the lack of sufficient oxygen supply in a quiescent environment.

MATHEMATICAL SCIENCES

General

00,506
PB93-124832 Not available NTIS
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Applied and Computational Mathematics Div.
Toward an Intelligent System for Mathematical Software Selection.
Final rept.
R. F. Boisvert. 1992, 10p.
Pub. in Programming Environments for High-Level Scientific Problem Solving, p79-88 1992.

Keywords: *Mathematics, *Computer software, *Expert systems, Directories, Selection, Statistical analysis, Mathematical models, Heuristic methods, Reprints, National Institute of Standards and Technology.

A vast collection of mathematical and statistical software is now available for use by scientists and engineers in their modeling efforts. This software represents a significant source of mathematical expertise, created and maintained at considerable expense. Unfortunately, the heterogeneity of the collection makes it difficult simply to determine what software is available to solve a given problem. In mathematical problem-solving environments of the future such questions will be fielded by expert software advisory systems. The paper describes knowledge engineering techniques and associated selection heuristics which can be used to develop such systems. A prototype under development for the Guide to Available Mathematical Software project at the National Institute of Standards and Technology (NIST) is demonstrated.

Algebra, Analysis, Geometry, & Mathematical Logic

00,507
PB93-153146 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
Fast Fourier Transform Algorithms for Real and Symmetric Data.
Final rept.
M. An, C. Lu, E. Prince, and R. Tolimier. 1992, 4p.
Pub. in Acta Crystallographica A48, p415-418 1992.

Keywords: *Sequences(Mathematics), Fast Fourier transforms, One dimensional, Real numbers, Computation, Symmetry, Algorithms, Reprints.

Procedures are described for computing the Fourier transforms of one-dimensional periodic sequences of real numbers and sequences that contain Hermitian and translational symmetry. Transforms from real sequences to Hermitian sequences and back are particularly efficient if the number of grid points in a period is two or four times an odd number. If the relation between points that are separated by half of a period is a change of sign or complex conjugate, periods that are a power of two times an odd number are also favorable for constructing algorithms that minimize redundant computations and complex multiplications.

00,508
PB93-159069 PC A03/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Applied and Computational Mathematics Div.
Monte Carlo Approach to the Approximation of Invariant Measures.
F. Y. Hunt. Jan 93, 27p, NISTIR-4980.

Keywords: Monte Carlo method, Mapping(Transformations), Numerical solution, Approximation, Convergence, Iteration, Theorems, *Invariant measures, Frobenius-Perron operator.

Approximation of absolutely continuous measures of maps of the interval and the closely related tasks of computing Lyapunov exponents and metric entropy are accomplished in principle by iterating the map to produce a sufficiently long trajectory. There is an alternative approach based on approximating the fixed point of the Frobenius-Perron operator. The authors present a Monte-Carlo implementation of the original piecewise constant method proposed by Ulam. The method has the advantage of not requiring explicit evaluation of the elements of the approximate Frobenius-Perron operator. Convergence rates of Ulam's method and some recently proposed higher order variants are discussed. Using the classical Bohman-Korovkin theorems of approximation theory the optimality of the rates are shown to be a consequence of the saturation phenomenon. Finally Ulam's scheme is used to estimate the leading Lyapunov exponent of a one dimensional map with an absolutely continuous measure. The authors propose an analytical criterion for comparing the results of using this method with an estimate obtained by iterating a long trajectory and illustrate its use in a numerical example.

00,509
PB93-189298 PC A04/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD.
Bibliographic Notes on Voronoi Diagrams.
J. Bemal. Apr 93, 58p, NISTIR-5164.

Keywords: *Computational geometry, *Bibliographies, Traveling salesman problem, Convex sets, Complexity, Stability, Algorithms, *Voronoi diagrams, Delauney triangulation, Robustness(Mathematics).

The paper presents a comprehensive annotated bibliography on various theoretical and algorithmic aspects of Voronoi diagrams and related diagrams. Bibliographic notes on the relationship between Voronoi diagrams and solutions to the Euclidean traveling salesman problem are also presented.

00,510
PB93-234714 PC A03/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD.
Observations About Joined Circular Arcs.
C. Witzgall. Aug 93, 25p, NISTIR-5216.

Keywords: *Curve fitting, Computer aided manufacturing, Points(Mathematics), Curves(Geometry), Plane geometry, Interpolation, Automation, Theorems, Biarcs.

There is interest in interpolating and approximating strings of points in the plane by piecewise-circular smooth curves because that representation lends itself readily to some computer-automated manufacturing processes. In particular, when interpolating a string of given consecutively distinct planar points, it is commonly assumed that these points are also the 'knots' of the interpolating piecewise-circular curve, that is, the points at which successive circular arcs connect. If an initial direction is specified, such interpolating curves are uniquely determined by the string of points. This interpolation problem becomes overdetermined, however, if directions are prescribed at all points of the string. In that case, pairs of circular arcs joined together smoothly at some suitable intermediate point - configurations termed 'biarcs' (K.M. Bolton) - can be used to connect successive points with prescribed directions. Several geometric observations concerning families of biarcs will be reported in the paper.

Statistical Analysis

00,511
PB93-125193 Not available NTIS
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Statistical Engineering Div.
Characterization of a Distribution Function by the Second Moment of the Residual Life.
Final rept.
J. Galambos, and C. Hagwood. 1992, 6p.
Pub. in Commun. Statist.-Theory Meth. 21, n5 p1463-1468 1992.

Keywords: *Distribution functions, Moments, Reprints, Characterization theorems, Residual life.

Let F(x) be a continuous distribution function with finite variance, and let h(sub 2)(y) = E(sub F)((T-y) squared (vertical line)T > or = y) denote the second moment of the residual life. In this paper we show that F(x) is characterized by h(sub 2)(y).

00,512
PB93-151108 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Statistical Engineering Div.
Calibration Problem as an Ill-Posed Inverse Problem.
Final rept.
C. Hagwood. 1992, 7p.
Pub. in Jnl. of Statistical Planning and Inference 31, p179-185 1992.

Keywords: Reprints, *Calibration problems, Ill posed problems, Inverse problems.

Let (x(1),y(1)),i = 1,2.....n, be data used for developing the calibration curve, y = alpha(circumflex) + beta(circumflex)x. Classically, given a future y' the associated x' is estimated by inverting the calibration line, which gives the estimate x'(circumflex) = (y'-alpha(circumflex))/beta(circumflex). This estimate has the deficiency of having an infinite variance. In this paper we use the techniques for solving an ill-posed inverse problem to develop a family of solutions x'(circumflex)(sub lambda) = (beta(circumflex)/(lambda + beta(circumflex)squared))(y'-alpha(circumflex)), lambda > 0, with finite variance. Out of this family we find one that outperforms x'(circumflex).

00,513
PB93-151900 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Statistical Engineering Div.
Prediction Intervals for a Balanced One-Way Random-Effects Model.
Final rept.
C. M. Wang. 1992, 17p.
Pub. in Commun. Statist.-Simula. 21, n3 p671-687 1992.

Keywords: *Mathematical models, *Predictions, Forecasting, Numerical analysis, Sampling, Tables(Data), Reprints.

The article presents numerical methods for constructing, from past sample data, prediction intervals to contain future samples from a population consisting of many batches. The appropriate model for this population is the balanced one-way random-effects model. Two special cases are considered. Specifically, future observations are restricted to be either from a single batch or from multiple batches with one observation per batch. Tables of factors are given for past data from 3(1)10 batches with 2, 6, or 10 observations per batch. The tables are restricted to 2, 6, or 10 future observations.

MEDICINE & BIOLOGY

Biochemistry

00,514
PB93-125912 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Chemical Kinetics Div.
Reduction Reactions of Water Soluble Cyano-Cobalt(III)-Porphyrins: Metal Versus Ligand Centered Processes.
Final rept.
S. Mosseri, P. Neta, A. Harriman, and P. Hambright. 1990, 8p.
Pub. in Jnl. of Inorganic Biochemistry 39, n2 p93-100 1990.

Keywords: *Porphyrins, *Cobalt, *Reduction(Chemistry), Radiolysis, Chemical reactions, Ligands, Complex compounds, Cyanides, Reprints.

Reduction reactions of dicyano-cobalt(III)-porphyrins (potential in vivo c-anide scavenger drugs) were studied by radiolytic and electrochemical methods using the water soluble tetrakis(4-sulfonatophenyl)porphyrin (TPPS) and tetrakis(N-methyl-4-pyridyl)porphyrin (TMPyP). For ((CN)2Co(III)TPPS)(1-), reduction occurs stepwise to the Co(II), Co(I), and finally to the phlorin anion. This behavior is similar to that of the colbalt prophyrins in the absence of cyanide, except that the cyanide ligand shifts the reduction potentials to much more negative values. On the other hand, under radiolytic conditions, ((CN)2Co(III)TMPyP)(1-) is reduced on the porphrin macrocycle by one electron to give the Co(III)-radical anion, which disproportionates into the initial complex and the two-electron ring reduced Co(III) phlorin. The radical anion is also formed by intramolecular electron transfer subsequent to the reaction of Co(II)TMPyP and cyanide. The results are compared with the chemistry of Vitamin B-12.

00,515
PB93-151975 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Inorganic Analytical Research Div.
Determination of Baseline Platinum Levels in Biological Materials.
Final rept.
R. Zeisler, and R. R. Greenberg. 1988, 7p.
Pub. in Proceedings of the International Workshop on Trace Element Analytical Chemistry in Medicine and Biology, v5, Berlin, NY., p297-303 1988.

Keywords: *Platinum, *Chemical analysis, *Liver, *Urinalysis, Humans, Neutron activation analysis, Trace elements, Gold 198, Gold 199, Reprints, Standards Reference Materials.

Extensive data on the presence of platinum at natural levels in the biosphere is needed. However, analytical methods to obtain those measurements have not been readily available. We have introduced a radiochemical neutron activation analysis (RNAA) procedure that is sufficiently sensitive for the determination of baseline platinum levels. This procedure is based on the element specific separation of gold for interference free counting, thus including the activation products of platinum, (199)Au, and of gold, (198)Au, for the determination of platinum and gold. The RNAA procedure has been applied to human liver tissues and biological Standard Reference Materials (SRMs). As an important addition to the investigated materials, the analysis of SRM 2670 'Toxic Metals in Freeze-Dried Urine' for normal and elevated concentration levels is discussed. In this urine pool sample, the natural platinum level is 8 pg/mL. In human liver samples from 1980 the platinum concentrations ranged from 5 to 57 pg/g (net weight).

00,516
PB93-153690 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Chemical Process Metrology Div.
Kinetics of a Multistate Enzyme in a Large Oscillating Field.
Final rept.
B. Robertson, and R. D. Astumian. 1990, 8p.
Pub. in Biophys. Jnl. 57, n4 p689-696 1990.

Keywords: *Enzymes, *Membranes, *Cells(Biology), *Electric fields, *Reaction kinetics, Mathematical models, Oscillations, Surface properties, Reprints, *Membrane transport enzymes, Electroconformational coupling.

A simple, general, and efficient method for calculating the response of a set of coupled first-order (or pseudo-first-order) chemical reactions to an arbitrarily large periodic field is described. The method is applied to a four-state membrane transport enzyme that is electroconformationally coupled to an ac field, i.e., the enzyme has electric charges that move concomitantly with a conformational transition. The calculation is done both for enzymes in a planar membrane and for enzymes in the spherical membrane of a cell or vesicle in suspension.

Botany

00,517
PB93-153153 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Inorganic Analytical Research Div.
Use of High Accuracy NAA for the Certification of NIST Botanical Standard Reference Materials.
Final rept.
D. A. Becker, R. R. Greenberg, and S. F. Stone. 1992, 13p.
Pub. in Jnl. of Radioanalytical and Nuclear Chemistry 160, n1 p41-53 1992.

Keywords: *Neutron activation analysis, *Chemical analysis, *Botany, *Radiochemistry, Performance standards, Comparison, Measuring instruments, Leaves(Botany), Plants(Botany), Reprints, *Standard reference materials, Certified reference materials, SRM 1515, SRM 1547.

Neutron activation analysis (NAA) is one of many analytical techniques used at the National Institute of Standards and Technology (NIST) for the certification of NIST Standard Reference Materials (SRMs). NAA competes favorably with all other techniques because of its unique capabilities for high accuracy even at very low concentrations for many elements. In this paper, instrumental and radiochemical NAA results are described for 25 elements in two new NIST SRMs, SRM 1515 (Apple Leaves) and SRM 1547 (Peach Leaves), and are compared to the certified values for 19 elements in these two new botanical reference materials.

Clinical Chemistry

00,518
PB94-108503 (Order as PB94-108461, PC A09/MF A02)
National Inst. of Standards and Technology, Gaithersburg, MD.
Evaluation of Serum Volume Losses during Long-Term Storage.
N. E. Craft, K. S. Epler, T. A. Butler, W. E. May, and R. G. Ziegler. 1993, 5p.
Included in Jnl. of Research of the National Institute of Standards and Technology, n98 n3 p355-359 May/Jun 93.

Keywords: *Biological preservation, *Blood, *Clinical chemistry, Sodium, Cervix neoplasms, Vitamin A, Carotenoids, Freezing, Evaporation, Sublimation, Case-control studies, *Serum volume losses.

Aliquots of serum collected in a large case-control study of cervical cancer were stored at -70 C for up to 4 years during implementation of the study. When 500 microliters serum aliquots were thawed in preparation for carotenoid and vitamin A assays, volumes were noticeably variable and fell below 500 microliters in the majority of the samples. The authors were concerned about evaporation/sublimation during storage of the samples because loss of water would concentrate the analytes of interest. In a representative sample of serum aliquots from the case-control study, 24 of 25 vials contained less than 500 microliters of serum. The mean sodium ion concentration (138.1 + or - 3.6 mmol/L) was within the normal range for human serum of 136-145 mmol/L, and no correlation was observed between serum volume and Na(1+) concentration. These results strongly suggest that the observed low volumes were not due to evaporative losses. Instead, the variably low volumes of serum aliquots were probably due to pipetting errors in the initial aliquotting resulting from the use of air-displacement pipettes.

Clinical Medicine

00,519
PB93-166700 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Ionizing Radiation Div.
Calculations on Displacement Corrections for In-Phantom Measurements with Ionization Chambers for Mammography.
Final rept.
J. Zoetelief, C. M. Eisenhauer, and J. J. Coyne. 1990, 13p.
Pub. in Physics in Medicine and Biology 35, n9 p1287-1299 1990.

Keywords: *Mammography, *Anatomical models, *Ionization chambers, Monte Carlo method, Radiation dosage, Reprints.

Displacement corrections for measurements with ionization chambers in-phantom for mammography are large and represent a major correction to consider for dose determinations with ionization chambers. Experimental data on displacement corrections depend to a large degree on the model used to extrapolate to zero cavity radius. Calculations of displacement correction factors using a Monte Carlo code are presented for different cavity shapes, i.e., spherical, cylindrical and disc-type, in various phantom materials simulating the average breast and breast composing tissues. In addition, the influence of wall material and depth in-phantom are studied. Exponential extrapolation to zero cavity radius should be performed to obtain the dose in homogeneous phantoms. Displacement corrections for photons as used in mammography seem compatible with geometrical considerations made previously. A discrepancy is found between depth-dose data derived from calculations and those found in experiments.

Cytology, Genetics, & Molecular Biology

00,520
PB93-150670 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Biotechnology Div.
DNA Base Modifications Induced in Isolated Human Chromatin by NADH Dehydrogenase-Catalyzed Reduction of Doxorubicin.
Final rept.
S. A. Akman, J. H. Doroshow, T. G. Burke, and M. Dizdaroglu. 1992, 7p.
Pub. in Biochemistry 31, n13 p3500-3506 1992.

Keywords: *DNA damage, *Chromatin, *Doxorubicin, *Free radicals, *NADH dehydrogenase, Antineoplastic agents, Catalysis, Transition metals, Reprints, Flavoenzymes.

The antineoplastic benzanthroquinone drug doxorubicin can undergo flavoenzyme-catalyzed one-electron reduction which, in an aerobic environment, leads to the generation of oxygen-derived species. We therefore sought to determine whether doxorubicin in the presence of NADH dehydrogenase and the transition metal ions Fe(III) or Cu(II) induces DNA base modifications in human chromatin. NADH dehydrogenase-catalyzed reduction of doxorubicin (25-100 micromolar) caused hydroxyl radical production detected as methane generated from dimethyl sulfoxide. Doxorubicin-induced DNA base modifications in chromatin required the addition of transition metal ion and was enhanced by the addition of active flavoenzyme. The scavengers of hydroxyl radical mannitol and dimethyl sulfoxide or catalase did not significantly affect doxorubicin/NADH/NADH dehydrogenase/transition metal ion-induced base modifications. Superoxide dismutase further enhanced production of all base modifications.

00,521
PB93-151314 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Biotechnology Div.
DNA Base Damage in Chromatin of Gamma-irradiated Cultured Human Cells.
Final rept.
Z. Nackerdien, R. Olinski, and M. Dizdaroglu. 1992, 15p.
Sponsored by Department of Energy, Washington, DC.
Pub. in Free Rad. Res. Comms. 16, n4 p259-273 1992.

Keywords: *DNA damage, *Chromatin, *Ionizing radiation, Gas chromatography, Mass spectroscopy, Cultured cells, Reprints.

We report on the chemical characterization of DNA base damage in chromatin of gamma-irradiated cultured human cells. Chromatin was isolated from unirradiated and irradiated cells and analyzed by gas chromatography/mass spectrometry with selected-ion monitoring after acidic hydrolysis of chromatin and trimethylsilylation of hydrolysates. A number of modified bases in chromatin isolated from irradiated cells were identified and quantitated. Background levels of all modified bases were observed in chromatin isolated from unirradiated cells. The radiation yields of a number of modified bases were increased significantly over their background levels at a dose as low as 42 Gy. In most cases, linear dose-yield relationships were obtained up to 200 Gy. The yields of guanine-derived bases amounted to 45% of the total net yield of modified bases measured, followed by almost equal yields of adenine-, cytosine- and thymine-derived bases.

00,522
PB93-151587 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Biotechnology Div.
DNA-Protein Cross-Linking between Thymine and Tyrosine in Chromatin of Gamma-irradiated or H2O2-Treated Cultured Human Cells.
Final rept.
R. Olinski, Z. Nackerdien, and M. Dizdaroglu. 1992, 5p.
Sponsored by Department of Energy, Washington, DC.
Pub. in Archives of Biochemistry and Biophysics 297, n1 p139-143, 15 Aug 92.

Keywords: *DNA damage, *Chromatin, *Cross-linking reagents, *Ionizing radiation, *Hydrogen peroxide, Free radicals, Cultured cells, Reprints.

Formation of DNA-protein cross-links between thymine and tyrosine in chromatin of gamma-irradiated or H2O2-treated cultured human cells is reported. Chromatin was isolated from cells, and subsequently hydrolyzed and derivatized. Analysis of derivatized hydrolysates by gas chromatography/mass spectrometry with selected-ion monitoring showed that a thymidine-tyrosine (Thy-Tyr) cross-link was formed. Exposure of cells to ionizing radiation at doses between 8.7 and 82 Gy (J/kg) increased the amount of the Thy-Tyr cross-link linearly up to fourfold over the background level. At doses higher than 82 Gy, the yield approached a plateau. Treatment of cells with H2O2 (0.5 to 10 mM) also increased the amount of the Thy-Tyr cross-link in a concentration-dependent manner. Addition of dimethyl sulfoxide and o-phenanthroline in the culture medium afforded partial inhibition of cross-link formation. Addition of catalase inhibitor KCN prior to H2O2 treatment increased the yield of cross-linking over the level observed with H2O2 treatment alone. Pretreatment of cells with ascorbic acid for 24 h without H2O2 caused formation of the Thy-Tyr cross-link.

00,523
PB93-153559 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Biotechnology Div.
DNA Base Modifications in Chromatin of Human Cancerous Tissues.
Final rept.
R. Olinski, T. Zastawny, J. Budzbon, M. Dizdaroglo, J. Skokowski, and W. Zegarski. 1992, 6p.
Sponsored by Department of Energy, Washington, DC.
Pub. in FEBS Letters 309, n2 p193-198 Sep 92.

Keywords: *DNA damage, *Malignant neoplasms, *Free radicals, *Base composition, Chromatin, Reprints.

Evidence exists that DNA damage by endogenous free radicals occurs in vivo, and there is a steady-state level of free radical-modified bases in cellular DNA. We have investigated endogenous levels of typical free radical-induced DNA base modifications in chromatin of various human cancerous tissues and their cancer-free surrounding tissues. Five different types of surgically removed tissues were used, namely colon, stomach, ovary, brain and lung tissues. In chromatin samples isolated from these tissues, five pyrimidine-derived and six purine-derived modified DNA bases were identified. These compounds are known to be formed typically by hydroxyl radical attack on DNA bases. In all cases, elevated amounts over control levels of modified DNA bases were found in cancerous tissues. The amounts of modified bases depended on the tissue type. Lung tissues removed from smokers had the highest increases of modified bases above the control levels, and the highest overall amounts. Colon cancer tissue samples had the lowest increases of modified bases over the control levels. The results clearly indicate higher steady-state levels of modified DNA bases in cancerous tissues than in their cancer-free surrounding tissues. Some of these lesions are known to be promutagenic, although others have not been investigated for their mutagenicity. Identified DNA lesions may play a causative role in carcinogenesis.

00,524
PB93-166122 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Center for Chemical Technology.
Protein Crystal Growth of Ribonuclease A and Pancreatic Trypsin Inhibitor Aboard the Maser 3 Rocket.
Final rept.
L. Sjolin, A. Wlodawer, G. Bergqvisat, H. Malmstrom, J. Zaar, L. A. Svensson, G. L. Gilliland, P. Holm, and K. Loth. 1991, 11p.
Pub. in Jnl. of Crystal Growth 110, n1-2 p322-332 1991.

Keywords: *Crystal growth, *Proteins, *Pancreatic ribonuclease, *Kazal pancreatic trypsin inhibitor, X-ray diffraction, Solutions, Spaceborne experiments, Reduced gravity, Reprints, *Maser 3 rocket.

The crystal growth of Bovine Ribonuclease A (RNase A) and Bovine Pancreatic Trypsin Inhibitor has simultaneously been studied onboard MASER 3, a sounding rocket, and in a ground reference unit. For crystallization to take place within the 7 minutes and 15 seconds of microgravity during the flight, both macro- and micro-seed techniques were utilized in supersaturated solutions and compared to standard seed-free crystallization procedures. Crystals were grown in both the microgravity experiment as well as in the ground reference unit. It was found that the convection-free environment produced more and larger crystals. The RNase A crystals diffracted X-rays to approximately 0.2 A higher resolution than previously observed in any terrestrially grown RNase A crystals. The refined structure based on these data contains new features not seen in the lower resolution structures.

00,525
PB93-166221 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Inorganic Analytical Research Div.
Application of Polyacrylamide-Gel Electrophroesis Neutron-Activation Anaiysis for Protein Quantification.
Final rept.
S. F. Stone, R. Zeisler, and G. E. Gordon. 1990, 7p.
Pub. in Biological Trace Element Research 26-7, p85-91 Jul 90.

Keywords: *Proteins, *Neutron activation analysis, *Polyacrylamide gel electrophoresis, Autoradiography, Densitometry, Reprints, Standard reference materials.

A combination of two methods, polyacrylamide gel electrophoresis (PAGE) and neutron activation analysis (NAA) has been applied to solutions containing phosphoproteins for protein determinations. The proteins were separated by molecular weight using PAGE, and then the whole gel was activated by neutron bombardment. Densitometric measurements of the visualized bands from (32)P, taken from autoradiographs of the activated gels, resulted in quantitation of the phosphorus, and then of related protein. This PAGE/NAA method was applied to several phosphoprotein-containing materials, including commercial milk products, and reference materials, i.e. IAEA A-11, milk powder and SRM 1845, Cholesterol in Egg Powder.

Dentistry

00,526
PB93-150738 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
Effect of a Two-Solution Fluoride Mouth Rinse on Remineralization of Enamel Lesions in vitro.
Final rept.
L. C. Chow, S. Takagi, and S. Shih. 1992, 5p.
See also PB92-154137. Sponsored by American Dental Association Health Foundation, Chicago, IL.
Pub. in Jnl. of Dental Research 71, n3 p443-447 Mar 92.

Keywords: *Dentistry, *Enamel, *Fluorides, *Teeth, *Mouthwashes, Sodium fluorides, Performance evaluation, Dental supplies, Dental caries, Dental calculi, In vitro analysis, pH, Microradiography, Reprints, *Mouth rinse.

A previous study showed that a two-solution fluoride (F) rinse deposited significantly more loosely-bound F on the tooth surface than did a sodium fluoride (NaF) rinse with the same F concentration (12 mmol/L). In the present study, this experimental rinse was evaluated for its ability to cause remineralization of enamel lesions in an in vitro pH-cycling model. Caries-like le-

sions were formed in the enamel of extracted human molars by means of a pH 4 demineralizing solution.

00,527
PB93-151868 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Polymers Div.
In vivo Fluoride Concentrations Measured for Two Hours After a NaF or a Novel Two-Solution Rinse.
Final rept.
G. L. Vogel, Y. Mao, C. M. Carey, L. C. Chow, and S. Takagi. 1992, 5p.
Sponsored by American Dental Association Health Foundation, Chicago, IL.
Pub. in Jnl. of Dental Research 71, n3 p448-452 Mar 92.

Keywords: *Dentistry, *Fluorides, *In vitro analysis, *Mouthwashes, Sodium fluorides, Dental caries, Dental supplies, Concentration(Composition), Performance evaluation, Reprints, *Mouth rinse, Plaque.

The concentrations of fluoride in various samples from the oral environment were measured at timed intervals after a novel rinse or a sodium fluoride (NaF) rinse, both containing a total of 12 mmol/L (228 ppm) fluoride. The novel rinse consisted of two solutions mixed just before application: Part A contained calcium chloride and sodium acetate; part B contained a hydrolyzable source of fluoride (sodium hexafluorosilicate) and sodium phosphate. Samples were obtained as follows: Single-site plaque-fluid samples were obtained by centrifugation of first-molar plaque; pooled whole-plaque samples were collected from second molars; centrifuged, pooled whole-saliva was collected by vacuum. All samples were analyzed by micro-analytical methods. The results of this study suggest that the new rinse may provide a greater cariostatic effect at the same fluoride dosage than does a NaF rinse.

00,528
PB94-109329 PC A04/MF A01
American Dental Association Health Foundation, Gaithersburg, MD. Paffenbarger Research Center.
Clinical Trial of an Adhesive Material.
Final rept. Sep 85-Jun 93.
R. L. Bowen, and F. C. Eichmiller. 24 Aug 93, 54p.
Contract NIDR-N01-DE-52557
Sponsored by National Inst. of Dental Research, Bethesda, MD.

Keywords: *Dental materials, *Adhesive bonding, *Materials testing, Resin bonding, Biocompatible materials, Polymers, Restorative materials, Iron ions, Teeth, Dental caries, Dental pulp cavity.

The clinical contract was instrumental in the development and transfer of over twenty years worth of laboratory investigation to clinically usable dentin adhesion systems. Phase I of the trial demonstrated the safety of materials based on novel chemistry and application techniques in human teeth. This phase of the study proved that the experimental materials did not elicit deleterious responses in the pulp tissues of vital human teeth. Phase II of the contract provided clinical experience necessary to refine the adhesive system into a clinically usable material. Improvements in materials and parallel improvements in application techniques and delivery methods made possible licensing of six commercial manufacturers with twelve different products based on this technology.

Electrophysiology

00,529
PB93-153682 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Chemical Process Metrology Div.
Non-Linear Effects of Periodic Electric Fields on Membrane Protein.
Final rept.
B. Robertson, R. D. Astumian, and T. Y. Tsong. 1989, 19p.
Pub. in Charge Field Eff. Biosyst. 2, p191-209 1989.

Keywords: *Electric fields, *Cell membrane, *Enzymes, *Electrochemistry, Membrane proteins, Reprints, Free energy transduction.

The nonlinear response of a two-state chemical reaction to an oscillating electric field is described. An interesting example is a conformational transition of a membrane protein in an applied ac electric field. Even a modest external field leads to a very large local field within the membrane and hence gives rise to nonlinear behavior. If the protein catalyzes a reaction, free energy is transduced from the electric field to the output reaction, even if that reaction is electrically silent. Many transport enzymes are ideal examples. The ac field can cause the enzyme to pump ions or molecules through the membrane against an (electro)chemical potential. The efficiency of this energy transduction can be as high as 30%.

Pathology

00,530
PB93-231835 PC A02/MF A01
Health Effects Research Lab., Research Triangle Park, NC.
Chemical Characterization of Mutagenic Fractions of Particles from Indoor Coal Combustion: A Study of Lung Cancer in Xuan Wei, China.
Journal article.
J. C. Chuang, S. A. Wise, S. Cao, and J. L. Mumford. c1992, 8p, EPA/600/J-93/379.
Pub. in Environmental Science and Technology, v26 n5 p999-1004 May 92. Prepared in cooperation with Battelle, Columbus, OH. Atmospheric Science and Applied Technology, National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Organic Analytical Research Div., and Institute of Environmental Health and Engineering, Beijing (China).

Keywords: *Indoor air pollution, *Air pollution effects(Humans), *Chemical analysis, Lung neoplasms, Bioassay, Combustion products, Particulates, Polycyclic aromatic hydrocarbons, Toxicity, Reprints, Xuan Wei(China), Yunnan(China), Coal burning, Semivolatile organic compounds.

In the rural Xuan Wei County, Yunnan Province, lung cancer mortality rates for women are among the highest in China. Most of these women are nonsmokers, and studies have shown that lung cancer in Xuan Wei is associated with domestic use of smoky coal under unvented conditions. The objective of the study is to determine the chemical constituents that may be linked to the high lung cancer rates in Xuan Wei using the bioassay-directed fractionation method. The results indicated that the presence of three to four-ring alkylated PAHs in the sample extract is a significant factor that may be linked to the high incidence of lung cancer in Xuan Wei, China. (Copyright (c) 1992 The American Chemical Society).

Pharmacology & Pharmacological Chemistry

00,531
PB93-125870 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Molecular Physics Div.
Binding of Cis-(1,2-Diaminocyclohexane)Platinum(II) and Its Derivatives to Duplex DNA.
Final rept.
K. J. Miller, S. L. McCarthy, and M. Krauss. 1990, 4p.
Pub. in Jnl. of Medicinal Chemistry 33, n3 p1043-1046 1990.

Keywords: *Cisplatin, *Deoxyribonucleic acids, Leukemia L1210, Isomerization, Nucleic acid conformation, Thermodynamics, DNA repair, Experimental melanoma, Reprints.

A theoretical study is presented for the binding of RR, SS, SR, and RS isomers of DAC(1,2-diammlnocyclohexane) or cis-Pt(II)-DAC to DNA. Cis-Pt(II)-DAC is ligated to N7(G) on two adjacent intrastrand guanine bases in a kinked pentamer duplex of DNA, (AT, CG, CG, GC, AT). The relative stability of the complexes is determined by calculating the relative conformational energy of the cis-Pt(II)-DAC-DNA complexes with molecular mechanics (MM), and the intrinsic binding or ligation energy with quantum mechanics (QM). The results suggest that the RR and SS isomers of Pt(II)-DAC adducts with DNA are more stable than the SR/RS isomer by 1.7 kcal/mol relative to the cis-Pt(II)-DAC(H2O)2 aquated species. Calculations on the overall stability of these isomers show that the SS and RR isomers are 6.5-8.2 kcal/mol more stable than the SR/RS isomers when bound to DNA, and this is attributed to differences in the strain energy in the DAC rings. The theoretical analyses of these compounds correlate a small differential activity with the trend in intrinsic binding energies. The RR isomer is more active in B16 melanoma cells and the SS is most active in L1210 leukemia, and in general the RR and SS isomers are more active than the SR and RS in most cell types.

Public Health & Industrial Medicine

00,532
PB93-215184 PC A05/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Report on Occupational Safety and Health for Fiscal Year 1990 (Under Public Law 91-596).
Sep 92, 77p.
See also report for FY 1989, PB92-222777.

Keywords: *Occupational safety and health, *Occupational diseases, Mortality, Malignant neoplasms, Asbestos, Toxicity, Spermatozoa, Health hazards, Fertility, Electrical shock, Anilines, Carcinogens, Agriculture, Injuries, Construction industry, Toluene diisocyanate, Toluene diamine, CAS 1332-21-4, CAS 584-84-9, CAS 496-72-0, CAS 95-53-4, CAS 62-53-3.

The report describes the efforts underway at NIOSH for the year 1990 in the areas of occupational safety and health. Some of the highlights during this time period occurred in the area of agricultural programs in which work was initiated on surveillance, research, and intervention in hazardous agricultural activities. Efforts in the area of construction provided assistance for identifying and evaluating occupational health risks to construction workers including mortality pattern analysis, identification of specific cancers linked to exposures on the job, and the role of asbestos (1332214) exposure in disease states. In the area dealing with evaluation of reproductive risks from exposure to workplace toxicants, methods were developed for studying men for sperm profiling, and methods for adapting fertility indicators for assessing health effects for workplace exposures in women. Special attention was given to toluene-diisocyanate (584849) and toluenediamine (496720). Bladder cancer was studied in workers occupationally exposed to ortho-toluidine (95534) and aniline (62533). Electrocution, one of the leading causes of traumatic occupational fatalities, was examined. A manual of analytical methods was published which contained additional information over the previous version.

Radiobiology

00,533
PB93-158673 PC A03/MF A01
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Ionizing Radiation Div.
Proton Monte Carlo Transport Program PTRAN.
M. J. Berger. Jan 93, 47p, NISTIR-5113.
See also PB93-146033. Sponsored by National Cancer Inst., Bethesda, MD.

Keywords: *Proton transport, Proton beams, Monte Carlo method, MeV range 10-100, MeV range 100-1000, Random walk, Random numbers, Slowing-down, Transport properties, Radiotherapy, Penetration, Diffusion, Dosimetry, PTRAN system, Water phantoms.

The report describes the structure and use of Monte Carlo programs that calculate the transport of proton beams through extended media. Although more generally applicable, the programs have been designed to deal with the penetration of 50- to 250-MeV beams through water phantoms. The Monte Carlo model takes into account multiple-scattering deflections and energy-loss straggling due to Coulomb interactions of

protons with atoms and orbital electrons. Nonelastic nuclear interactions are treated as an absorptive effect. The PTRAN system at present consists of several cross-section preparation programs and two main codes, PTRAN3D and PTRAN1D. PTRAN3D applies to an incident narrow pencil beam, and calculates (a) the deposition of energy as function of depth and radial distance from the beam axis, and (b) and the energy spectra of the primary protons as function of depth. Program PTRAN1D is a simplified version which runs faster and omits the calculation of the radial distribution of energy deposition.

00,534
PB93-166031 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Ionizing Radiation Div.
Dose Equivalent Response of Tissue-Equivalent Proportional Counters to Low Energy Neutrons.
Final rept.
H. Schuhmacher, A. Kunz, H. G. Menzel, J. J. Coyne, and R. B. Schwartz. 1990, 5p.
Pub. in Radiation Protection Dosimetry 31, n1-4 p383-387 1990.

Keywords: *Radiation protection, *Personnel dosimetry, Tissues(Biology), Dose equivalents, Neutrons, Reprints.

Recent investigations of area monitors based on tissue-equivalent proportional counters have shown that their dose equivalent response, R(sub H)=M(sub H)/H*(10), (M(sub H), dose equivalent reading: H*(10), ambient dose equivalent) is considerably smaller than one for neutron energies below a few hundred keV. Measurements in monoenergetic neutron beams with energies of 2 and 24 keV are described. Results for R(sub H) are presented and various means of improving the dose equivalent response in the low energy region are investigated: detector size, wall thickness and pressure of gas filling.

00,535
PB93-166486 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Chemical Process Metrology Div.
Charge-Field Interactions in Cell Membranes and Electroconformational Coupling: Transduction of Electric Energy by Membrane ATPases.
Final rept.
T. Y. Tsong, and R. D. Astumian. 1989, 11p.
Pub. in Charge Field Eff. Biosyst.-2, p167-177 1989.

Keywords: *Electric fields, *Cell membrane, *Adenosinetriphosphatase, *Signal transduction, Biological transport, Mitochondria, Enzyme activation, Biosynthesis, Proteins, Deoxyribonucleic acids, Ribonucleic acids, Erythrocytes, Reprints.

Electron and ion transports, reductions and oxidations are common chemical reactions in cellular energy transductions. These reactions involve charges and are, thus, susceptible to influence by an electric field. Many laboratories have recently discovered that electric fields in certain ranges and frequencies can stimulate DNA, RNA, and protein biosyntheses. Enhancement and suppression of enzyme activities have also been reported. The paper will discuss the authors experiments in which electric fields of defined frequency and amplitude were used to activate mitochondrial ATPases of rat liver and beef heart and the (Na,K)-ATPase of human erythrocytes. Electroconformational coupling which the authors proposed earlier will be used to explain these results. The following two papers will elaborate the concept in greater details and analyze some simple reaction mechanisms which are relevant to the present discussion. The authors will also show that nonlinear effects arising from the coulombic interaction of membrane proteins and an electric field are responsible for the many observed effects.

00,536
PB93-166585 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Chemical Process Metrology Div.
Response of Living Cells to Very Weak Electric Fields: The Thermal Noise Limit.
Final rept.
J. C. Weaver, and R. D. Astumian. 1990, 4p.
Pub. in Science 247, n4941 p459-462 1990.

Keywords: *Electric fields, *Cells(Biology), Membrane potential, Signal to noise ratio, Catalysis, Detection, Reprints.

A simple model is presented which considers cells as possible detectors of very weak periodic electric fields. This yields a general relation between cell size and both thermally induced fluctuations in membrane potential, U(t), and the maximum change in membrane potential, Delta U(sub max) (t), caused by an applied field. The authors regard Delta U(sub max) as the signal and make the basic assumption that if the signal-to-noise ratio (S/N) is unity or greater, then the cell may be able to respond to the applied field. The simplest version of the model provides a broad-band estimate of the smallest applied electric field to which membrane macromolecules can directly respond. This is shown to be small. It is further shown that much smaller fields can be detected if the detection mechanism responds to voltage signals in only a narrow band of frequencies and/or is capable of signal averaging. These may occur by the mechanism of field induced variation in the catalytic activity of membrane-associated enzymes. Both extensions to the simplest theory resolve the paradox presented by the apparent violation of the kT noise limit observed in some experiments. A similar analysis carried out for molecules in solution shows that the minimum field to which cytosolic macromolecules can respond is much larger than for membrane macromolecules.

00,537
PB93-219749 PC A04/MF A01
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Ionizing Radiation Div.
Penetration of Proton Beams through Water. 1. Depth-Dose Distribution, Spectra and LET Distribution.
M. J. Berger. Jul 93, 52p, NISTIR-5226.
Sponsored by National Cancer Inst., Bethesda, MD.

Keywords: *Proton irradiation, *Proton dosimetry, *Depth dose distribution, Monte Carlo method, MeV range 10-100, MeV range 100-1000, Proton beams, Transport theory, Energy spectra, Radiotherapy, LET, PTRAN computer program, Water phantoms.

The penetration of protons through a water phantom was calculated with the Monte Carlo program PTRAN, which takes into account energy-loss straggling, multiple scattering, and nonelastic nuclear interactions. Calculations were done for incident proton beams incident with energies between 250 MeV and 50 MeV. The information obtained includes depth-dose curves as well as energy spectra of primary protons at various depth. Good agreement was found between calculated and measured relative depth-dose distributions, except at extreme depths. A systematic tabulation was made of various parameters that characterize the shape of the Bragg peak. The energy spectra were used to obtain LET distributions for primary protons. In addition, dose-averaged LET-values were obtained which include contributions from primary protons as well as from secondary charged particles produced in nuclear reactions.

00,538
PB93-219772 PC A05/MF A01
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Ionizing Radiation Div.
Assessment of the Role of Charged Secondaries from Nonelastic Nuclear Interactions by Therapy Proton Beams in Water.
S. M. Seltzer. Jul 93, 84p, NISTIR-5221.
Sponsored by National Cancer Inst., Bethesda, MD.

Keywords: *Oxygen 16 target, *Proton reactions, *Secondary emission, *Cross sections, MeV range 10-100, MeV range 100-1000, Ionizing radiation, Biological effects, Secondary reactions, Proton irradiation, Slowing-down, Radiotherapy, Water, Let, Graphs(Charts).

The report summarizes the calculations and the syntheses of data performed to develop information on the cross sections in water for nonelastic nuclear interactions and the production of nuclear secondaries for protons with energies below 250 MeV. The data developed include the total nonelastic cross section and the number and energy distributions for secondary n, p, d, t, (3)He, alpha, and some 32 recoiling nuclides produced in interactions of p+(16)O. These data are used to evaluate slowing-down spectra (and pertinent moments) for the charged nuclear secondaries. Combining the information with primary proton fluence spectra obtained from Monte Carlo transport calculations, illustrative results are given for the average LET, as a function of depth, for unmodulated and modulated proton beams. Based on a crude biological-response model, the results are then used in exploratory calculations to estimate the relative biological effectiveness of the proton beams.

MILITARY SCIENCES

Logistics, Military Facilities, & Supplies

00,539
PB93-158657 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Comparison of Ceiling Jet Temperatures Measured in an Aircraft Hanger Test Fire with Temperatures Predicted by the DETACT-QS and LAVENT Computer Models.
W. D. Walton, and K. A. Notarianni. Jan 93, 36p, NISTIR-4947.
See also PB87-197943. Sponsored by Fire Administration, Emmitsburg, MD., and Public Buildings Service, Washington, DC. Office of Real Property Management and Safety.

Keywords: *Fire tests, *Hangars, *Military air facilities, *Temperature distribution, Flame propagation, Computer programs, Heat flux, Sprinkler systems, Fire protection, Response time, Fire detection systems, Ceilings, Predictions, *Compartment fires, DETACT-QS computer program, LAVENT computer program.

Predictions of the DETACT-QS and LAVENT computer fire models are compared to temperature measurements made during the calibration of the fire detection system in a military aircraft hanger. Two 3.34 sq m Isopropyl alcohol pool fire tests of 60 second duration were conducted in the 37 m by 40 m by 14 m high main hanger bay. Brass disks with a known thermal response time index (RTI) were used to simulate the thermal element in a sprinkler or heat detector. Measurements were made of centerline plume temperatures, and ceiling jet gas and disk temperatures at radial distances of 0, 2.7, 5.5, 8.2, and 11.0 m from the centerline of the fire, 380 mm below the ceiling. At a radial distance of 5.5 m, measurements of ceiling jet gas temperatures were also made 150 and 610 mm below the ceiling. Comparisons of predictions and measurements demonstrate some of the strengths and weakness of DETACT-QS and LAVENT for the fire scenario.

00,540
PB94-109238 PC A04/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Office of Applied Economics.
Present Worth Factors for Life-Cycle Cost Studies in the Department of Defense (1994).
S. R. Petersen. Oct 93, 63p, NISTIR-4942-1.
See also PB88-138227, PB92-238663 and report for 1993, PB93-120772. Sponsored by Assistant Secretary of Defense (Production and Logistics), Washington, DC.

Keywords: *Life cycle costs, *Present worth, *Energy supplies, *Military facilities, Benefit cost analysis, Economic analysis, Return on investment, Cost engineering, Fuels, Energy conservation, Construction, Regional analysis, Tables(Data), Department of Defense Military Construction Program.

The document provides 47 tables of present worth factors to be used in computing the present worth of future costs (or cost reductions) in economic analyses of design decisions for projects in the Department of Defense (DoD) Military Construction Program. These factors are especially useful for the life-cycle cost analysis of investments in buildings or building systems which are intended to reduce future operating, maintenance, repair, replacement, and energy costs over the life of the facility. The tables include present worth factors for both one-time costs and annually recurring costs, based on the FEMP discount rate of 3.1% (FY 1994) for energy-related studies and on the OMB discount rate of 4.0% and 4.5% for short-term and long-term non-energy studies, respectively. Forecasts of future energy prices used in the calculation of present worth factors for energy costs were provided by the Energy Information Administration.

NATURAL RESOURCES & EARTH SCIENCES

Geology & Geophysics

00,541
PB93-166411 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD.
Molecular Wedge in a Brittle Crack: A Simulation of Mica Water.
Final rept.
R. M. Thomson. 1990, 11p.
See also PB90-193616.
Pub. in Jnl. of Materials Research 5, n3 p524-534 1990.

Keywords: *Fractures(Materials), *Cracking(Fracturing), *Mica, Crack propagation, Molecular structure, Interfacial tension, Crystal lattices, Molecules, Water, Simulation, Reprints.

The paper presents an atomic calculation of the wedging effect which occurs in a brittle crack when molecules of a chemisorbing species of molecules of sufficient size enter the crack mouth. A surface tension develops at the tip of the wedge caused by the difference between the covered and vacuum surface energies. This force draws the chemisorbing molecules towards the crack tip, and distorts the crack faces, causing, in turn, a compensating elastic force on the molecules which tends to eject the molecules. The authors calculate the equilibrium penetration of the wedging molecules, and the configuration of the crack and wedge by an atomistic calculation. The authors simulate mica/water chemistry by means of a simplification of the mica lattice and calculate interactions between the water and mica on the basis of Born-Mayer. Water is found to form a wedge tongue of two or three molecular thicknesses and a length of about 12 molecular distances, which penetrates into the crack tip cohesive zone. When strong wedging action occurs at a crack tip, crack advance near threshold loadings will be limited by molecular diffusion through the wedge tongue.

00,542
PB93-185973 PC A03/MF A01
California Univ., Davis. Dept. of Civil and Environmental Engineering.
Procedures for Selecting Earthquake Ground Motions at Rock Sites (Revised).
Final rept.
I. M. Idriss. Mar 93, 25p, NIST/GCR-93/625.
Sponsored by National Inst. of Standards and Technology, Gaithersburg, MD.

Keywords: *Earthquakes, *Tremors, Shock waves, Attenuation, Damping, Spectral response, Seismic effects, Time studies, Motion studies.

There are several procedures that can be used to select earthquake ground motions at a rock site. These procedures include: (1) utilization of motions previously recorded at rock sites during similar size earthquakes and at distances comparable to those under consideration; (2) estimation of a target spectrum and then selection of natural time histories whose spectral ordinates are comparable to those of the target spectrum for the period range of interest; (3) estimation of a target spectrum and then generation of a synthetic time history whose spectral ordinates provide a reasonable envelope to those of the target spectrum; or (4) use of simulation techniques starting with the source and propagating the appropriate wave forms to generate a suite of time histories that can then be used to represent the earthquake ground motions at the rock site of interest. For the purpose for which NIST plans to use the procedures outlined in the report, only procedures number (2) and number (3) are covered herein. Estimation of the target spectrum is based on currently available empirically derived attenuation relationships.

00,543
PB93-196251 (Order as PB93-196228, PC A07/MF A02)
Joint Inst. for Lab. Astrophysics, Boulder, CO.
Measuring Low Frequency Tilts.
M. L. Kohl, and J. Levine. 1993, 12p.
Prepared in cooperation with National Inst. of Standards and Technology, Boulder, CO.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n2 p191-202 Mar/Apr 93.

Keywords: *Tiltmeters, Performance evaluation, Power spectra, Measurement, Boreholes, Pendulums, Stability, Design.

A borehole tiltmeter with a sensitivity of a few nanoradians is described. It is composed of two orthogonal horizontal pendulums with free periods of 1 s. The pendulums are insensitive to barometric pressure fluctuations, and the measured temperature coefficient is less than 30 nrad/C. The range of the pendulums is about + or - 5 micro rad, and their response is linear within 1% and stable over several years. The performance of the tiltmeter in the field was evaluated using tidal data obtained from a closely spaced array of boreholes in Southern California.

Mineral Industries

00,544
PB93-178622 PC A04/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Robot Systems Div.
Intelligent Control System for a Cutting Operation of a Continuous Mining Machine.
J. A. Horst, and A. J. Barbera. Mar 93, 54p, NISTIR-5142.
Prepared in cooperation with Advanced Technology and Research, Inc., Laurel, MD.

Keywords: *Mining equipment, *Artificial intelligence, *Control equipment, Cutters, Cutting, Expert systems, Mining engineering, System engineering, Controllers, Computer programs, Real time operations, *Continuous mining machine.

An implementation using the Real-time Control System (RCS) reference model is described. RCS is characterized by explicit software modules that perform behavior generation, sensory processing, and world modelling functions at different hierarchical levels. A detailed and sharply defined approach to RCS design is described in the paper. It is characterized by task-based problem decomposition, cyclic execution, generic software modules, standardized communications interfaces, and state machines. The particular implementation described demonstrates the utility of the methodology for the control of a cutting operation of a continuous mining machine used in the underground coal mining industry.

NAVIGATION, GUIDANCE, & CONTROL

Navigation Systems

00,545
PB93-184257 PC A04/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Robot Systems Div.
Applying the NIST Real-Time Control System Reference Model to Submarine Automation: A Maneuvering System Demonstration.
Rept. for Nov 90-Mar 92.
H. M. Huang, R. Hira, R. Quintero, and A. Barbera.
Feb 93, 75p, NISTIR-5126.
Prepared in cooperation with Advanced Technology and Research, Inc., Laurel, MD. Sponsored by Defense Advanced Research Projects Agency, Arlington, VA.

Keywords: *Underwater navigation, *Submarines, *Automatic control, *Real time operations, Ship maneuvering, Computer systems programs, Systems engineering, Controllers, Simulations, Autonomous navigation.

The Robot Systems Division (RSD) at the National Institute of Standards and Technology (NIST) has been developing a generic reference model architecture, known as the Real-time Control System (RCS), for the last two decades. The paper demonstrates the application of RCS to submarine automation. The automation of submarine operations involves complex system functionality and requires an enormous amount of intelligence to be built into the software to enable a submarine to operate in an unstructured and often hostile environment semi-autonomously. Software is emerging as a predominant factor in determining the success and performance of modern large and complex intelligent systems. Meanwhile, the fundamental principles and generic approaches of handling software and systems engineering processes are still being explored within the engineering community. RCS attempts to address some fundamental system development issues including a software engineering methodology and a generic architecture. The resolution of these issues can facilitate a unified approach for developing intelligent systems. An open system architecture can also be achieved to serve as a foundation for system integration and coordination. The paper provides an implementation example of the RCS methodology research projects ongoing at NIST RSD.

NUCLEAR SCIENCE & TECHNOLOGY

Fusion Devices (Thermonuclear)

00,546
PB93-206928 PC A13/MF A03
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD.
Review of Irradiation Effects on Organic-Matrix Insulation.
N. J. Simon. Jun 93, 299p, NISTIR-3999.
Sponsored by Department of Energy, Washington, DC. Office of Fusion Energy.

Keywords: *Nuclear fusion, *Electrical insulation, *Epoxy composites, *Magnets, Toroidal pinch devices, Tests, Cryogenics.

The objectives of the review are: (1) to provide a compilation of all the relevant mechanical property data on irradiation damage to epoxy-matrix electrical insulating materials; (2) to assess whether these data can be used to select superconducting magnet insulation for next-generation fusion devices, such as ITER and TPX; and (3) to determine what further data need to be obtained for the selection of insulation for ITER toroidal and poloidal magnets.

Nuclear Instrumentation

00,547
PB93-166049 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Ionizing Radiation Div.
Measurement of the Energy Response of Superheated Drop Neutron Detectors.
Final rept.
R. B. Schwartz, and J. B. Hunt. 1990, 4p.
Sponsored by Bureau of Medicine and Surgery (Navy), Washington DC.
Pub. in Radiation Protection Dosimetry 34, n1/4 p377-380 1990.

Keywords: *Neutron dosimetry, *Dosimeters, Superheating, Spectrometers, Drops, Reprints, Bubble detectors, Energy response.

Nuclear Instrumentation

Devices using the nucleation of superheated drops for neutron detection show great promise as neutron dosemeters, and, by using such devices with different energy thresholds, spectroscopic information may be obtained. The response as a function of energy was measured for three dose equivalent measuring devices: the Pen Dosimeter and the area monitor, supplied by Apfel Enterprises (New Haven, Conn., USA), and the Bubble Dosimeter, supplied by Bubble Technology Industries (BTI) (Chalk River, Ontario, Canada). In addition, the energy response was also measured for the Bubble Detector Spectrometer (also supplied by BTI). Low energy monoenergetic measurements (thermal to 144 keV) were performed with the beams at the NIST Research Reactor; higher energy monoenergetic measurements (33 keV to 18 MeV) were performed at the NPL Van de Graaff accelerator. Measurements were also made of the response to the distributed neutron energy spectra from bare and moderated (252)Cf and from Am-Be radionuclide sources.

Radiation Shielding, Protection, & Safety

00,548
PB93-173425 PC A03/MF A01
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Ionizing Radiation Div.
Dose in Water from External Irradiation by Electrons: Radiation Protection Data.
S. M. Seltzer. Feb 93, 20p, NISTIR-5136.
Sponsored by Department of Energy, Washington, DC. Office of Health and Environmental Research.

Keywords: *Radiation doses, *Electron irradiation, Radiation protection, Dose equivalents, Monte Carlo method, Tables(Data), Graphs(Charts), Water phantoms.

Results from electron Monte Carlo calculations are given for the absorbed dose at depths of 7, 40, 300 and 1000 mg/sq cm in a slab water phantom irradiated by electrons incident with kinetic energies from 50 keV to 10 MeV and at angles (with respect to the normal to the surface) of 0, 15, 30, 45, 60, 75 and 89 deg. Electron number and energy reflection coefficients are given also for these cases.

Radioactive Wastes & Radioactivity

00,549
NUREG/CR-4735-V8 PC A06/MF A02
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Metallurgy Div.
Evaluation and Compilation of DOE Waste Package Test Data. Biannual Report, August 1989-January 1990.
Technical rept.
C. G. Interrante, A. C. Fraker, and E. Escalante. Jun 93, 105p.
Also available from Supt. of Docs. See also NUREG/CR-4735-V7. Sponsored by Nuclear Regulatory Commission, Washington, DC. Div. of High-Level Waste Management.

Keywords: *Radioactive waste disposal, *High-level radioactive wastes, *Packaging, Radioactive waste storage, Borosilicate glass, Waste forms, Vitrification, Leaching, Test methods, Corrosion, Crack propagation, Environmental transport, Austenitic stainless steels, Spent fuel, Cladding, Yucca Mountain Project, Nevada disposal sites.

The report summarizes evaluations by the National Institute of Standards and Technology (NIST) of some of the Department of Energy (DOE) activities on waste packages designed for containment of radioactive high-level nuclear waste (HLW) for the six-month period, August 1989 - January 1990. This includes reviews of related materials research and plans, information on the Yucca Mountain, Nevada disposal site activities, and other information regarding supporting research and special assistance. Short discussions are given relating to the publications reviewed and complete reviews and evaluations are included. Reports of other work are included in the Appendices.

Reactor Engineering & Nuclear Power Plants

00,550
DE93018036 PC A02/MF A01
National Inst. of Standards and Technology (NEL), Gaithersburg, MD.
Full-Thickness Clad Beam Fracture-Toughness Tests.
R. deWit, S. Low, D. Hame, and R. Fields. 6 Apr 93, 10p, DOE/OR/22034-1.
Contract AI05-92OR22034
Sponsored by Department of Energy, Washington, DC.

Keywords: *Pressure Vessels, *Structural Beams, Bending, Cracks, Displacement Gages, Fatigue, Measuring Instruments, Mechanical Tests, Strain Gages, EDB/420500, EDB/220200.

A full-thickness clad-beam bend bar from a nuclear reactor pressure vessel from ORNL was used as a demonstration test beam. A fatigue crack was introduced into the beam and the specimen then instrumented with crack opening clip gages, load line displacement gages, and strain gages. The specimen was cooled to (minus)25.5 C and loaded at a constant stroke rate of 2.49 mm/min until fracture occurred after 230 seconds. Records for all gages are given. The crack length at fracture onset was 117.2 mm; the fracture surface was fairly flat and appeared to be cleavage. It is concluded that the test was successful, and it is determined that the demonstration beam test will serve as Bendbar Test (number sign)1. 8 figs.

OCEAN SCIENCES & TECHNOLOGY

Marine Engineering

00,551
PB93-139087 PC A03/MF A01
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Comparison of Full Scale Fire Tests and a Computer Fire Model of Several Smoke Ejection Experiments.
E. Braun, D. L. Lowe, W. W. Jones, R. Carey, P. Tatem, and J. Bailey. Nov 92, 44p, NISTIR-4961.
Prepared in cooperation with David Taylor Research Center, Annapolis, MD. Sponsored by Naval Research Lab., Washington, DC.

Keywords: *Fire tests, *Diesel fuels, *Polyethylene, *Computerized simulation, *Ships, Doors, Vents, Burning rate, Toxicity, Smoke, Ventilation, Compartments, Test methods, Transport properties, Combustion, Temperature distribution, Mathematical models, *Compartment fires.

Data were obtained from four large scale shipboard fire tests. The test series was designed to evaluate the efficacy of a smoke ejection system for the removal of smoke and heat from compartments around the compartment of fire origin. Using diesel oil and polyethylene beads as fuel, tests were conducted at 0.5 MW and 1.0 MW. The data obtained from these tests were evaluated in terms of the reduction of heat and smoke in ajacent passageways. These results were compared to numerical simulations of the shipboard environment. The test results showed that the atmospheric conditions in compartments/passageways adjacent to the compartment of fire origin could be made survivable by isolating the fire compartment and ventilating adjacent spaces. It was found that, under the ventilation conditions of these tests, effective reduction in smoke and heat from peak values to ambient values took 350 to 400 s, depending on the compartment's proximity to the door of the compartment of fire origin. Comparisons with the numerical simulation showed that the authors can predict the environment which develops with reasonable confidence.

Physical & Chemical Oceanography

00,552
PB93-166213 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Inorganic Analytical Research Div.
Instrumental Neutron Activation Analysis of Standard Reference Material 1941, Organics in Marine Sediment: Element, Content and Homogeneity.
Final rept.
S. F. Stone, B. Koster, and R. Zeisler. 1990, 9p.
Pub. in Biological Trace Element Research 26-7, p579-587 Jul 90.

Keywords: *Organic compounds, *Neutron activation analysis, *Sediments, *Marine environments, Chemical analysis, Environmental monitoring, Concentration(Composition), Measuring Instruments, Reprints, *Standard reference materials, *SRM 1941.

The National Institute of Standards and Technology has issued a new Standard Reference Material (SRM) 1941, 'Organics in Marine Sediment'. In addition to the organic constituents, over thirty elements have been determined by instrumental neutron activation analysis and prompt-gamma activation analysis. The homogeneity of the material was investigated and variances of single elemental concentrations in 250 mg samples were found to be 1% or less with regard to major inorganic constituents and rare earth elements (REE). A slightly higher variance was found for elements that may stem from biological or anthropogenic input. The element concentrations determined in this work are discussed in comparison to concentrations in other similar reference materials. Concentrations for 30 elements will be included for information on the certificate.

ORDNANCE

Ammunition, Explosives, & Pyrotechnics

00,553
PB93-125888 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Effects of Pressure on the Thermal Decomposition Kinetics, Chemical Reactivity and Phase Behavior of RDX.
Final rept.
P. J. Miller, S. Block, and G. J. Piermarini. 1991, 11p.
Pub. in Combustion and Flame 83, n1-2 p174-184 1991.

Keywords: *RDX, *Decomposition reactions, *Reaction kinetics, *Pressure, Phase diagrams, Decomposition, Phase transformations, Infrared spectroscopy, X-ray diffraction, Chemical reactions, Explosives, Reprints.

The effects of pressure on the thermal decomposition kinetics, chemical reactivity and phase behavior of RDX have been studied by a combination of measurement techniques in conjunction with a high pressure diamond anvil cell. These techniques include: (1) Fourier transform infrared (FTIR) spectroscopy for kinetic measurements and phase identification, (2) energy dispersive x-ray powder diffraction for identification of the observed polymorphic forms and also compression measurements, and (3) optical polarizing microscopy for visual detection and confirmation of phase transformations and determinations of transition pressures. The ruby method of pressure measurement was used in all methods employed. Studies were generally limited to the region where decomposition rates could be measured within reasonable laboratory time, i.e., below 10 GPa and 573K. The P-T phase diagram for RDX was determined to 573K and 7.0 GPa, delineating the stability fields of three solid phases, alpha, beta and gamma, and the liquids. The alpha and beta phases of RDX were found to thermally decompose, while the gamma phase transformed to either alpha or beta before reaching decomposition temperatures. The decomposition rate of alpha phase was found to increase with increasing pressure suggesting a bimolecular-type mechanism.

Armor

00,554
PB93-138998 PC A03/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Limited Tests to Investigate Whether the Size of Body Armor Samples influences Ballistic Test Results.
Final rept.
K. R. Eberhardt, and L. K. Ellason. Oct 92, 33p, NISTIR-4927.
Sponsored by Department of Justice, Washington, DC. Office of Justice Programs.

Keywords: *Body armor, *Terminal ballistics, *Size determination, *Impact tests, Sampling, Standards, Data analysis, Test methods, Penetration, Probability theory.

A limited series of tests was conducted to investigate whether the size of body armor samples influences ballistic results. An analysis of the results was conducted, and none of the factors evaluated (the size of the sample, the size of the impact pattern, or front-versus-back armor panels) were found to be statistically significant. However, the confidence intervals were large and the possibility exists that these factors could have an effect on test results. The analysis determined that a major experiment would be necessary to quantify effects. It is concluded that the size of test samples, alone, is not critical to the results obtained from tests in accordance with NIJ Standard-0101.03. It appeared that the size of the shot pattern was more likely to have an effect on the results of ballistic testing, than the other factors that were investigated. The expense of the experiments required to quantify the effects of armor size and shot pattern size was not believed to be warranted, for both can be avoided by not conducting tests on small size armor samples.

Guns

00,555
PB93-124865 Not available NTIS
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Applied and Computational Mathematics Div.
Space Marching Difference Schemes in the Nonlinear Inverse Heat Conduction Problem.
Final rept.
A. S. Carasso. 1992, 19p.
See also PB91-144360.
Pub. in Inverse Problems 8, p25-43 1992.

Keywords: *Gun barrels, *Conduction, *Finite difference method, *Nonlinear systems, *Heat transmission, Algorithms, Thermal diffusivity, Thermal conductivity, Mathematical models, Reprints, Space Marching Difference Schemes, Inverse heat conduction.

For ill-posed initial value problems, step by step marching computations are unconditionally unstable, and necessarily blow-up numerically as the mesh is refined. However, for the 1D nonlinear inverse heat conduction problem, we show how to construct consistent marching schemes that blow-up much more slowly than the counterpart analytical problem. Several new space marching finite difference schemes are formulated and compared with existing schemes relative to their error amplification properties. Using the Lax-Richtmyer theory, we evaluate the L2 norms of the linearized discrete solution operators mapping the sensor data into the desired temperature and gradient histories at the inaccessible active surface. Various combinations of space and time differencing are examined, leading to 18 different algorithms. It is shown that while most of the 18 schemes cannot recover the thermal pulses at the gun tube wall, two of the new methods provide reasonably accurate results. A tendency to underestimate peak values in fast, narrow thermal pulses, is also noted.

00,556
PB93-161347 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD.
Test Procedure for Handgun Accuracy.
N. J. Calvano, and D. E. Frank. Jan 93, 16p, NISTIR-5109.
Sponsored by National Inst. of Justice, Washington, DC.

Keywords: *Firing error indicators, *Test methods, *Accuracy, *Pistols, Ballistics, Firing tests(Ordnance), Test facilities, Small arms, Optical measurement, Gun sights.

A test procedure has been designed to determine the accuracy of handguns. The test procedure utilizes a collimated light beam as a means of establishing a fixed reference line to which the handgun sights are aligned. The aim point of the handgun once aligned is the center of the target, which is positioned on the reference line. The handgun accuracy is determined as the distance of the 10-shot bullet group from the aim point, expressed as the average value of the X and Y coordinates of the 10 shots.

PHYSICS

General

00,557
AD-P008 068/9 PC A01/MF A01
National Inst. of Standards and Technology, Gaithersburg, MD.
Status of the Soft X-ray/XUV Optical Metrology Program at the National Institute of Standards and Technology.
R. Watts, D. Ederer, T. Lucatorto, and C. Tarrio. 5 Mar 92, 2p.
This article is from 'Physics of X-ray Multilayer Structures' AD-A255 383, pd3-1 thru pd3-2.

Keywords: *Soft x rays, Curvature, Diameters, Gratings(Spectra), Mirrors, Measurement, Monochromators, Optical properties, Metrology, Reflectometers, Standards, Surfaces, Throughput, *Extreme ultraviolet radiation, Component Reports, Beamless, US NIST.

The National Institute of Standards and Technology (NIST) has initiated a program devoted to the characterization of soft x-ray optics at the wavelength of use. Although NIST has an operational XUV characterization facility which it is using to make measurements for users across the country, that facility suffers from several deficiencies that will limit its usefulness in the coming years. Therefore, we are constructing an improved monochromator/ reflectometer beamline that will upgrade and extend our XUV measurement capabilities. We will describe the optical properties of the new monochromator and discuss the state of the design of the new reflectometer. The monochromator is based on a varied line spaced plane grating that uses simple optical elements in a fixed entrance slit/fixed exit slit geometry. Important features of the new instrument include high throughput, simple wavelength scanning, resolutions in excess of 1000, and the ability to characterize large (in excess of 30 cm diameter) optical surfaces with small radii of curvature.

00,558
N93-25059/5 (Order as N93-24978/7, PC A22/MF A04)
National Inst. of Standards and Technology (PL), Boulder, CO. Time and Frequency Div.
Designing for Frequency and Time Metrology at the 10 to the Minus 18 Power Level.
F. L. Walls, L. M. Nelson, and G. R. Valdez. Jun 92, 5p.
In ESA. Proceedings of the 6th European Frequency and Time Forum p 477-481. Sponsored in Part by CECOM Center for Space Systems.

Keywords: *Frequency measurement, *Frequency standards, *Time measurement, Frequency stability, Metrology, Algorithms, Carrier to noise ratios, Errors, Phase detectors, Signal to noise ratios, Signal transmission, White noise.

Some of the key parameters that significantly affect the overall architecture of a system that is being designed to measure frequency or time accuracy to 3 by 10(exp -18) are examined. Specifically, the following are investigated: the timing errors in signal transmission for distances up to 100 m; the effect of changes in temperature and rf amplitude on timing (low frequency) errors in several available phase detectors; and the influence of measurement algorithms on the allowable level of white phase noise in the system as a function of the carrier frequency.

00,559
PB93-124873 Not available NTIS
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Quantum Metrology Div.
Quantum Theory of the Dynamical Cerenkov Emission of X-rays.
Final rept.
A. Caticha. 1992, 10p.
Contract AFOSR-88-0018
Sponsored by Air Force Office of Scientific Research, Bolling AFB, DC.
Pub. in Physical Review B 45, n17 p9541-9550, 1 May 92.

Keywords: *Cerenkov radiation, *X radiation, X-ray diffraction, X-ray sources, Hard x radiation, Quantum theory, Tuning, Reprints.

X-ray photons propagating in a crystal close to the Bragg-diffraction directions have an effective index of refraction that may be larger than 1. Electrons moving rapidly in crystals may therefore emit x rays. This process, the dynamical Cerenkov radiation (DCR) of x rays, is studied with use of a theory that is closely analogous to the quantum theory of the Cerenkov effect in homogeneous media. Features of the DCR process that are calculated include the spectral width due to x-ray absorption, the systematic deviations of the photon energy from Bragg's law, the influence of the orientation of the crystal surface, etc. Extensions of the theory to cover many-beam diffraction cases or more detailed calculations of the small recoil effects are straightforward to carry out. The photons are emitted at the far tails of the diffraction region, they are overwhelmingly in the 'diffracted' plane-wave component, and, in the two-beam case there is no anomalous Borrmann absorption. DCR is a particularly efficient emission process for hard x rays (several tens of keV) with extremely high spectral density (within small angular regions). The use of DCR for a tunable source of hard x rays should be seriously considered.

00,560
PB93-125151 Not available NTIS
National Inst. of Standards and Technology (PL), Boulder, CO. Quantum Physics Div.
End-Point Sensitivity in Quantum Dynamic Calculations.
Final rept.
L. Eno. 1991, 4p.
Pub. in Molecular Physics 74, n4 p923-926 1991.

Keywords: *Quantum electrodynamics, Sensitivity analysis, Limits(Mathematics), Computation, Accuracy, Reprints.

A simple way is described for assessing the accuracy of quantum dynamic calculations as the (integration) end-points are varied. It depends upon the determination of first order elementary sensitivity coefficients (i.e., partial derivatives) of the corresponding dynamic scattering matrix with respect to each of the chosen end-points. The sensitivity coefficients draw upon knowledge of the propagated wavefunction matrix; no further significant work is required than that which is already involved in obtaining the scattering matrix.

00,561
PB93-125177 Not available NTIS
National Inst. of Standards and Technology (PL), Boulder, CO. Quantum Physics Div.
Regular Mechanism of Parity and Time Invariance Nonconserving Effects Enhancement in Neutron Capture and Scattering Near p-Wave Compound Resonances.
Final rept.
V. V. Flambaum. 1992, 11p.
Grant NSF-PHY89-04035
Prepared in cooperation with National Science Foundation, Washington, DC.
Pub. in Physical Review C 45, n1 p437-447 Jan 92.

Keywords: *Neutron capture, Uranium 238, Thorium 232, T invariance, Wave functions, Scattering, Parity, Reprints.

Recent measurements of parity nonconserving (PNC) effects in (238)U and (232)Th contradict the results of random matrix theory for nuclear compound states. In this work, the value of the PNC effect is expressed in terms of a wave function at the nuclear surface where the wave function of the compound state is not 'random' due to boundary conditions. A mechanism is suggested which can explain the permanent sign and large value of these effects. The correlations between compound-state components are considered. The T- and P-odd effects can be expressed in terms of observed P-odd effects. The 'dynamical enhancement' of small interactions in other reactions and other systems is also discussed.

00,562
PB93-125219 Not available NTIS
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Atomic Physics Div.
Comment on 'Measurement of the Lamb Shifts in Singlet Levels of Atomic Helium'.
Final rept.
J. D. Gillaspy, and W. C. Martin. 1992, 2p.
Pub. in Physical Review A 45, n7 p5315-5316, 1 Apr 92.

Keywords: *Helium, *Rydberg states, *Casimer effect, Lamb shift, Energy levels, Atomic spectroscopy, Precision, Reprints.

Lichten, Shiner, and Zhou (Phys. Rev. A 43, 1663 (1991)) have stated that their precision measurements of Rydberg states of helium confirm the existence of intra-atomic Casimir forces. This interpretation misidentifies the Casimir-force shift, which in fact is too small to be detected with their present level of accuracy.

00,563
PB93-125656 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Temperature and Pressure Div.
Nuclear Orientation of (160)Tb in Tb Single Crystal.
Final rept.
H. Marshak, P. Roman, and W. D. Brewer. 1989, 23p.
Pub. in Physical Review C 40, n4 p1759-1781 1989.

Keywords: *Terbium 160, *Nuclear alignment, Nuclear structure, Oriented nuclei, Gamma radiation, Mixing ratio, E1-transitions, E2-transitions, M1-transitions, M2-transitions, Single crystals, Interacting boson model, Reprints.

Nuclear orientation of (160)Tb in Tb single crystal has been carried out in order to obtain accurate values of multipole mixing ratios for 22 transitions in (160)Dy. The experimental aspects are described in some detail as they form the basis for obtaining high quality data. Three different methods were used to extract the mixing ratios and they are shown to agree very well. Our results for both E1/M2 and E2/M1 transitions are compared to other measurements. The signs and magnitude of the E1/M2 mixing ratios cannot be explained in the basis of Coriolis mixing of the K=0, 1, and 2 bands. Comparison of our results for the 299, 1178, and 1272 keV transitions with those from gamma-gamma directional correlation measurements indicate that some E3 admixture may be present in these transitions. The mixing ratios we obtained for the E2/M1 transitions are in reasonably good agreement with the predictions of IBA-1.

00,564
PB93-125698 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Precision Engineering Div.
Elementary Particle Physics in the Dalton Manner.
Final rept.
E. Marx. 1992, 15p.
Pub. in Jnl. of the Franklin Institute 329, n1 p111-125 Jan 92.

Keywords: *Elementary particles, Elementary particle interactions, Relativistic theory, Quantum mechanics, Strong interactions, Weak interactions, Annihilation reactions, Pair production, Hadrons, Leptons, Reprints.

Elementary particles are separated into basic particles and composite particles paralleling Dalton's classification of chemical substances into atoms and molecules. The 'atoms' or basic particles are the neutrino, the pion, and the archaeobaryon. Particle reactions are interpreted as rearrangements of basic particles augmented by pair creation and annihilation. The number of each basic particle is algebraically conserved. The notation of chemistry is adapted to particle reactions. A Lagrangian density containing only six parameters is proposed as a starting point for calculations of masses, lifetimes, and cross sections involving strong, weak, and electromagnetic interactions.

00,565
PB93-143923 PC A06/MF A02
National Inst. of Standards and Technology, Gaithersburg, MD.
Journal of Research of the National Institute of Standards and Technology, November-December 1992. Volume 97, Number 6.
1992, 105p.
Also available from Supt. of Docs. as SN703-027-00049-1. See also PB93-143931 through PB93-143964 and PB93-131381.

Keywords: *Research, Electric discharges, Wattmeters, Calibration, Electron-atom collisions, Electron-ion collisions, Electron impact, Refractive index, Partial discharges.

Contents: System for Measuring Conditional Amplitude, Phase, or Time Distributions of Pulsating Phenomena; High Power CW Wattmeter Calibration at NIST; Compact Fitting Formulas for Electron-Impact Cross Sections; Accuracy of the Double Variation Technique of Refractive Index Measurement.

00,566
PB93-143956 (Order as PB93-143923, PC A06/MF A02)
National Inst. of Standards and Technology, Gaithersburg, MD.
Compact Fitting Formulas for Electron-Impact Cross Sections.
Y. K. Kim. 1992, 4p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v97 n6 p689-692 Nov/Dec 92.

Keywords: *Electron-atom collisions, *Electron-ion collisions, *Electron impact, Ionization cross sections, Excitation, Hydrogen, Helium.

Compact fitting formulas, which contain four fitting constants, are presented for electron-impact excitation and ionization cross sections of atoms and ions. These formulas can fit experimental and theoretical cross sections remarkably well, when resonant structures are smoothed out, from threshold to high incident electron energies (<10 keV), beyond which relativistic formulas are more appropriate. Examples of fitted cross sections for some atoms and ions are presented. The basic form of the formula is valid for both atoms and molecules.

00,567
PB93-146033 PC A03/MF A01
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Ionizing Radiation Div.
ESTAR, PSTAR, and ASTAR: Computer Programs for Calculating Stopping-Power and Range Tables for Electrons, Protons, and Helium Ions.
M. J. Berger. Dec 92, 31p, NISTIR-4999.
Sponsored by Department of Energy, Washington, DC. Office of Health and Environmental Research.

Keywords: *Stopping power, *Alpha particles, *Electrons, *Protons, *Range, Computer programs, ASTAR computer program, ESTAR computer program, PSTAR computer program.

This report describes three computer codes, ESTAR, PSTAR and ASTAR, which calculate stopping-power and range tables for electrons, protons, or helium ions, according to methods described in ICRU Reports 37 and 49. The codes provide output for electrons in any stopping material, and for protons and helium ions in 74 materials. Executable programs are provided which can be run on IBM-compatible personal computers. Fortran source code is also provided for implementing the codes on other computers.

00,568
PB93-148963 Not available NTIS
Japan Atomic Energy Research Inst., Tokai.
Spectral Data and Grotrian Diagrams for Highly Ionized Cobalt, Co VIII through Co XXVII.
T. Shirai, A. Mengoni, Y. Nakai, K. Mori, H. Sakai, J. Sugar, and W. L. Wiese. c1992, 99p.
Prepared in cooperation with National Inst. of Standards and Technology, Gaithersburg, MD., and Hiroshima-Denki Inst. of Tech. (Japan).
Included in Jnl. of Physical and Chemical Reference Data, v21 n1 p23-121 Jan/Feb 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Cobalt ions, *Spectra, Atomic energy levels, Transition probabilities, Oscillator strengths, Wavelengths, Plasma, Tables(Data), Grotrian diagrams.

Wavelengths, energy levels, level classifications, oscillator strengths, and atomic transition probabilities for the cobalt ions Co VIII to Co XXVII are tabulated. A short review is given for the wavelength measurements on each stage of ionization. Grotrian diagrams are also presented to provide graphical overviews. The literature has been surveyed to March 1990.

00,569
PB93-148997 Not available NTIS
American Chemical Society, Washington, DC.
Journal of Physical and Chemical Reference Data, Volume 21, No. 2, March/April 1992.
Bimonthly rept.
D. R. Lide. c1992, 225p.
See also PB93-149003, PB93-149011, and PB93-148948. Prepared in cooperation with American Inst. of Physics, New York. Sponsored by National Inst. of Standards and Technology, Gaithersburg, MD.
Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Molecular clouds, *Stellar envelopes, *Vanadium ions, *Microwave spectra, Tables(Data).

Contents: Recommended Rest Frequencies for Observed Interstellar Molecular Microwave Transitions--1991 Revision; Spectral Data and Grotrian Diagrams for Highly Ionized Vanadium, V VI through V XXIII.

00,570
PB93-149011 Not available NTIS
Japan Atomic Energy Research Inst., Tokai.
Spectral Data and Grotrian Diagrams for Highly Ionized Vanadium, V VI through V XXIII.
T. Shirai, T. Nakagaki, J. Sugar, and W. L. Wiese. c1992, 116p.
Prepared in cooperation with National Inst. of Standards and Technology, Gaithersburg, MD.
Included in Jnl. of Physical and Chemical Reference Data, v21 n2 p273-389 Mar/Apr 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Vanadium ions, *Spectra, Atomic energy levels, Transition probabilities, Oscillator strengths, Wavelengths, Plasma, Tables(Data), Grotrian diagrams.

Wavelengths, energy levels, level designations, oscillator strengths, and atomic transition probabilities for the vanadium ions V VI to V XXIII are tabulated. A short review of the line identifications and wavelength measurements is given for each stage of ionization. Grotrian diagrams are also presented to provide graphical overviews. The literature has been surveyed to September 1991.

00,571
PB93-149086 Not available NTIS
Joint Inst. for Lab. Astrophysics, Boulder, CO.
Collisions of H(+), H((sub 2)(+)), H((sub 3)(+)), ArH(+), H(-), H, and H2 with Ar and of Ar(+) and ArH(+) with H2 for Energies from 0.1 eV to 10 keV.
A. V. Phelps. c1992, 15p.
Included in Jnl. of Physical and Chemical Reference Data, v21 n4 p883-897 Jul/Aug 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Atom-molecule collisions, *Ion molecule collisions, *Ion-atom collisions, *Hydrogen, *Argon, Argon hydrides, Argon ions, Hydrogen ions, Momentum transfer, Charge transfer, Cross sections, KeV range 1-10, EV range, Milli eV range, Dissociation, Excitation, Ionization, Tables(data).

Graphical and tabulated data and the associated bibliography are presented for cross sections for elastic, excitation, and ionization collisions of H(+), H((sub 2)(+)), H((sub 3)(+)), ArH(+), H(-), H, and H2 with Ar and of Ar(+) and ArH(+) with H2 for laboratory energies from 0.1 eV to 10 keV. Where appropriate, drift velocities and reaction or excitation coefficients are calculated from the cross sections and are recommended for use in analyses of swarm experiments and elec-

trical discharges. Collisions of H with Ar are of especial interest because of the very large cross sections for excitation of the H atoms at low energies.

00,572
PB93-149094 Not available NTIS
American Chemical Society, Washington, DC.
Journal of Physical and Chemical Reference Data, Volume 21, No. 5, September/October 1992.
Bimonthly rept.
D. R. Lide. c1992, 204p.
See also PB93-149102 through PB93-149128 and PB93-149045. Prepared in cooperation with American inst. of Physics, New York. Sponsored by National inst. of Standards and Technology, Gaithersburg, MD.
Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Argon ions, *Cadmium inorganic compounds, *Zinc inorganic compounds, *Solubility, *Fluorescence, Transition probabilities, Nitrogen, Oxygen.

Contents: A Critical Compilation of Atomic Transition Probabilities for Singly Ionized Argon; The Solubility of Some Sparingly Soluble Salts of Zinc and Cadmium in Water and in Aqueous Electrolyte Solutions; Franck-Condon Factors, r-Centroids, Electronic Transition Moments, and Einstein Coefficients for Many Nitrogen and Oxygen Band Systems.

00,573
PB93-149102 Not available NTIS
Zagreb Univ. (Yugoslavia).
Critical Compilation of Atomic Transition Probabilities for Singly Ionized Argon.
V. Vujnovic, and W. L. Wiese. c1992, 21p.
Prepared in cooperation with National Inst. of Standards and Technology, Gaithersburg, MD.
Included in Jnl. of Physical and Chemical Reference Data, v21, n5 p919-939 Sep/Oct 92. Available from American Chemical Society, 1155 Sixteenth St., NW, Washington, DC. 20036-9976.

Keywords: *Argon ions, *Transition probabilities, Atomic energy levels, Argon plasma, Branching ratio, Wavelengths, Tables(Data).

The authors have critically compiled the atomic transition probabilities of Ar II lines by combining recent high-accuracy lifetime data with branching-ratio emission measurements. They present several comparisons of the various literature data, including theoretical results, and they discuss their assessment procedure in detail. On the basis of the procedure, the authors present an extensive list of critically evaluated transition probabilities with uncertainty estimates.

00,574
PB93-150746 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Technology Div.
Transport Current Effects on Flux Creep and Magnetization in Nb-Ti Multifilament Cable Strands.
Final rept.
R. W. Cross. 1992, 6p.
See also PB91-202903 and PB91-202911. Sponsored by Department of Energy, Washington, DC.
Pub. in Advances in Cryogenic Engineering Materials, v38 ptB p731-736 1992.

Keywords: *Superconducting cables, Electric current, Niobium alloys, Titanium alloys, Magnetization, Hysteresis, Reprints, *Flux creep, Multifilaments.

We used a Hall-probe magnetometer to measure the effect of transport current on magnetization and flux creep in Nb-Ti multifilamentary cable strands. Large transport currents, up to 70% of the critical current I(c) were applied to the sample. The external field was applied transverse to the current and sample length. When the applied current approached the critical current of the strand, the magnetization decreased and the Lorentz-force interaction between the field and the transport current dominated the creep. Both the short-time and long-time decay of magnetization increased. The increase in the short-time decay was too large to be explained by eddy current decay. The long-time decay was enhanced by a factor of 4 with a transport current of approximately 0.7I(c).

00,575
PB93-150779 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Inorganic Analytical Research Div.
Determination of Uranium and Thorium in Materials Associated with Real Time Electronic Solar Neutrino Detectors.
Final rept.
J. D. Fassett, and W. R. Kelly. 1992, 7p.
Pub. in Nuclear Instruments and Methods in Physics Research B69, p503-509 1992.

Keywords: *Neutrino detection, *Uranium, *Thorium, Mass spectroscopy, Chemical analysis, Trace amounts, Radiation detectors, Targets, Reprints, Thermal ionization.

The application of isotope dilution thermal ionization mass spectrometry to the determination of both uranium and thorium in four different target materials used or proposed for electronic neutrino detectors is described. Isotope dilution analysis is done using highly enriched (233)U and (230)Th separated isotopes. Sensitivity of the technique is such that sub-picogram amounts of material are readily measured. The overall limit to measurement is caused by contamination of these elements during the measurement process. Uranium is more easily measured than thorium because both the instrumental sensitivity is higher and contamination is better controlled. The materials analyzed were light and heavy water, pseudocumene, and mineral oil.

00,576
PB93-151140 Not available NTIS
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Atomic Physics Div.
Observation of Quantized Motion of Rb Atoms in an Optical Field.
Final rept.
P. S. Jessen, C. Gerz, P. D. Lett, R. J. C. Spreeuw, C. I. Westbrook, W. D. Phillips, and S. L. Rolston. 1992, 4p.
Sponsored by Office of Naval Research, Arlington, VA.
Pub. in Physical Review Letters 69, n1 p49-52, 6 Jul 92.

Keywords: *Quantum optics, Resonance fluorescence, High resolution, Reprints, Rubidium atoms, Laser cooling, Atom traps, Lamb-Dicke effect.

We observe transitions of laser-cooled Rb between vibrational levels in subwavelength-sized optical potential wells, using high-resolution spectroscopy of resonance fluorescence. We measure the spacing of the levels and the population distribution, and find the atoms to be localized to 1/15 of the optical wavelength. We find up to 60% of the population of trapped atoms in the vibrational ground state. The dependence of the spectrum on the parameters of the optical field provides detailed information about the dynamics of laser-cooled atoms.

00,577
PB93-151264 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Technology Div.
Proposed Measurement of the Fine Structure Constant Using a Coulomb-Blockade Charge Pump.
Final rept.
J. M. Martinis, G. Zimmerli, T. M. Eiles, H. D. Jensen, and E. Williams. 1992, 2p.
Pub. in Conference Record for Conference on Precision Electromagnetic Measurements (CPEM'92), Paris, France, June 9-12, 1992, p14-15.

Keywords: *Sommerfeld constant, Experimental design, Josephson effect, Measurement, Capacitors, Electrometers, Reprints, *Fine structure constant.

We propose a new experiment to measure the fine structure constant alpha. The experiment uses an electron pump to transfer a countable number of electrons onto a cryogenic capacitor. Given a definite number of electrons on this capacitor, we can obtain a value for alpha by measuring the voltage in terms of the Josephson effect and the capacitance in terms of the calculable capacitor.

00,578
PB93-151611 Not available NTIS
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Electron and Optical Physics Div.
Treatment of Continuum-Continuum Coupling in the Theoretical Study of Above Threshold Ionization.
Final rept.
L. Pan. 1990, 9p.
Pub. in Proceedings of NATO ASI Series, Atom in Strong Fields, Kos, Greece, October 9-21, 1988, p447-456 1990.

Keywords: *Multi-photon processes, Photon-atom collisions, Perturbation theory, Laser radiation, Ionization, Reprints, Coulomb-Volkov state.

In the theoretical study of intense fields multiphoton processes, especially the above-threshold ionization process, the nonperturbative treatment of continuum-continuum coupling has been one of the major difficulties. A set field-dressed continuum states has been derived which can form a basis for a less perturbative approach.

00,579
PB93-151769 Not available NTIS
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Quantum Metrology Div.
X-ray Beam Position Monitor Using a Quadrant PIN Diode.
Final rept.
S. H. Southworth, and P. L. Cowan. 1992, 5p.
Pub. in Nuclear Instruments and Methods in Physics Research A319, p51-55 1992.

Keywords: *Synchrotron radiation, *X-ray sources, *Beam monitors, *PIN diodes, Monochromatic radiation, Performance evaluation, Silicon diodes, Beam position, Reprints.

We report on the use of a quadrant PIN silicon photodiode as a position monitor of the monochromatized X-ray beam in a synchrotron radiation beamline. Signal levels corresponding to the horizontal and vertical beam positions and to the total intensity intercepted are derived simultaneously. The detector is demonstrated to be quite sensitive to the angular and translational motion of the X-ray beam arising from movement of beamline optical components. Use of the detector to obtain diagnostic information and as a position sensor in feedback loops is discussed.

00,580
PB93-153195 Not available NTIS
National Inst. of Standards and Technology (PL), Boulder, CO. Time and Frequency Div.
Atomic Physics Tests of Nonlinear Quantum Mechanics.
Final rept.
J. J. Bollinger, D. J. Heinzen, W. M. Itano, S. L. Gilbert, and D. J. Wineland. 1992, 7p.
See also PB92-170752. Sponsored by Air Force Office of Scientific Research, Bolling AFB, DC., and Office of Naval Research, Arlington, VA.
Pub. in Proceedings of Conference Foundations of Quantum Mechanics, Santa Fe, NM., May 27-31, 1991, p40-46 1992.

Keywords: *Quantum mechanics, Radiofrequency spectroscopy, Schrodinger equation, Nuclear spin, Nonlinear problems, Atomic physics, Causality, Tests, Reprints, Penning traps.

Atomic physics experiments which test a nonlinear generalization of quantum mechanics recently formulated by Weinberg are described. The experiments search for a dependence of hyperfine transition frequencies or nuclear spin precession frequencies on the relative populations of the hyperfine or nuclear spin states. The experiments set limits less than 10 microHz on the size of the possible nonlinear contributions to these frequencies. In some cases this can be interpreted as a limit of less than about 10(Sup -26) on the fraction of binding energy per nucleon that could be due to a nonlinear correction to a nuclear Hamiltonian. The possibility that a nonlinear addition to quantum mechanics violates causality is discussed.

00,581
PB93-153203 Not available NTIS
National Inst. of Standards and Technology (PL), Boulder, CO. Time and Frequency Div.
Low Order Modes of an Ion Cloud in a Penning Trap.
Final rept.
J. J. Bollinger, D. J. Heinzen, F. L. Moore, W. M. Itano, and D. J. Wineland. 1992, 3p.
Sponsored by Office of Naval Research, Arlington, VA.
Pub. in Physica Scripta 46, p282-284 1992.

Keywords: *Ion storage, Trapping(Charged particles), Beryllium ions, Spheroids, Reprints, Penning traps, Laser cooling, Ion clouds.

The electrostatic modes of a cloud of ions confined in a Penning trap are discussed in the limit that the Debye length is small compared to the cloud dimensions and

the cloud dimensions are small compared to the trap dimensions. Experimental measurements of some of these mode frequencies on plasmas of laser-cooled Be(+) ions agree well with calculations. Observation of the modes provides a nondestructive method for obtaining information on the ion density and cloud shape. In addition, excitation of the modes by static field asymmetries may provide a practical limit to the density and number of charged particles that can be stored in a Penning trap.

00,582
PB93-153534 Not available NTIS
National Inst. of Standards and Technology (CSTL), Boulder, CO. Thermophysics Div.
Radiative Heat Transfer in Transient Hot-Wire Measurements of Thermal Conductivity.
Final rept.
C. A. Nieto de Castro, R. A. Perkins, and H. M. Roder. 1991, 13p.
Pub. in International Jnl. of Thermophysics 12, n6 p985-997 Nov 91.

Keywords: *Thermal conductivity, *Toluene, *Radiative heat transfer, *Hot-wire flowmeters, Heat transmission, Measuring instruments, Thermodynamic properties, Thermal radiation, Thermophysical properties, Thermodynamic properties, Reprints.

New measurements of the thermal conductivity of liquid toluene between 300 and 550 K have been used to study the importance of radiative heat transfer when using the transient hot-wire technique. The experimental data were used to obtain the radiation correction to the hot-wire temperature rise. Radiation-corrected values of thermal conductivity are reported. This study shows that the transient hot-wire method is much less affected by radiation than steady-state techniques.

00,583
PB93-153609 Not available NTIS
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Ionizing Radiation Div.
Physical Parameters for L X-ray Production Cross-Sections.
Final rept.
S. Puri, B. Chand, M. L. Garg, P. N. Trehan, N. Singh, and J. H. Hubbell. 1992, 4p.
Pub. in X-ray Spectrometry 21, p171-174 1992.

Keywords: *X-ray spectra, Coster-Kronig transitions, Ionization cross sections, KeV range 10-100, Photoionization, Reprints.

Photon-induced L x-ray production cross-sections for the elements with 56 = or < z = or < 92 were calculated at different energies in the range 11-60 keV using the photoionization cross-sections based on the relativistic Dirac-Hartree-Slater (RDHS) model, fluorescence yields and Coster-Kronig transition probabilities based on the RDHS model and two sets of emission rates based on the Dirac-Fock (DF) model and the Dirac-Hartree-Slater (DHS) model. These calculated results were compared with the experimentally measured cross-sections to check the applicability of emission rates based on the DF and DHS models.

00,584
PB93-153633 Not available NTIS
National Inst. of Standards and Technology (PL), Boulder, CO. Time and Frequency Div.
Ionic Crystals in a Linear Paul Trap.
Final rept.
M. G. Raizen, J. M. Gilligan, J. C. Bergquist, W. M. Itano, and D. J. Wineland. 1992, 9p.
Sponsored by Office of Naval Research, Arlington, VA., and Air Force Office of Scientific Research, Bolling AFB, DC.
Pub. in Physical Review A 45, n9 p6493-6501, 1 May 92.

Keywords: *Ion storage, Trapping(Charged particles), Atomic spectroscopy, Atomic clocks, Ionic crystals, Mercury ions, Mercury 199, Frequency standards, Microwaves, Reprints, Paul traps, Ion traps, Laser cooling.

The authors describe a configuration for a linear Paul rf ion trap. This trap can store a long string of ions with a small second-order Doppler shift, comparable to that achieved with a single ion in a quadrupole Paul trap. Crystallized strings of trapped ions, as well as more complicated structures, have been observed in the trap. They report an observation of the 40.5-GHz ground-state hyperfine interval of (199)Hg(1+) by microwave-optical double-resonance spectroscopy and discuss prospects for a microwave frequency standard based on a trapped string of ions.

00,585
PB93-153773 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Gas and Particulate Science Div.
Application of the Hough Transform to Electron Diffraction Patterns.
Final rept.
J. C. Russ, D. S. Bright, J. Christian Russ, and T. N. Hare. 1989, 35p.
Sponsored by Texas Univ. at Austin. Dept. of Biomedical Engineering.
Pub. in Jnl. of Computer-Assisted Microscopy 1, n1 p3-37 1989.

Keywords: *Microscopy, *Electron diffraction, *Computer applications, Image analysis, Pattern recognition, Reprints, *Hough transform, Channeling patterns.

The Hough transform maps information from the spatial domain to a space in which the coordinates define lines or curves. This space accumulates values from multiple points in the spatial domain, to identify the principal arrangements of the points. This technique has been applied to other image interpretation problems, but is here used to extract information from electron diffraction patterns. Examples include locating lines of points in patterns from single crystals, and the additional points due to precipitates or superlattices. In addition to straight lines, it is also possible to locate rings in selected area patterns, and to accurately measure the radius and integrated intensity of the rings. Convergent beam electron diffraction patterns and selected area channeling patterns contain linear features which can be accurately located and their widths measured. The Hough transform is moderately demanding on computer memory and time, but is within the capability of dedicated personal computers.

00,586
PB93-162873 PC A07/MF A02
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
NIST REACTOR: Summary of Activities, July 1991 through September 1992.
Feb 93, 132p, NISTIR-5120.
See also PB92-149731.

Keywords: *NBSR reactor, Research reactors, Activation analysis, Cold neutrons, Crystal structure, Neutron diffraction, Neutron radiography, Nondestructive tests, Analytical chemistry, Fullerenes, Hydrogen, Magnetism, Polymers, Macromolecules, Microstructure, Magnetic superconductors, Langmuir-Blodgett films, Multilayers.

The report summarizes all the programs which use the NIST reactor. It covers the period for July 1991 through September 1992. The programs range from the use of neutron beams to study the structure and dynamics of materials through nuclear physics and neutron standards to sample irradiations for activation analysis, isotope production, neutron radiography, and nondestructive evaluation.

00,587
PB93-165710 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Electron and Optical Physics Div.
Second Order Transfer Matrices for Inhomogeneous Field Wien Filters Including Spin-Precession.
Final rept.
M. R. Scheinfein. 1989, 15p.
Pub. in Optik 82, n3 p99-113 1989.

Keywords: Transfer matrix method, Focusing, Aberration, Correction, Reprints, *Wien filters, Electron spin polarization, Spin precession.

The inhomogeneous field Wien filter offers an alternative to the conventional uniform field Wien filter, magnetic sector and electrostatic deflector for electron-spin rotation. The main advantage of the inhomogeneous field Wien filter used for electron-spin rotation is the point-to-point double focusing which preserves the cylindrical symmetry in a beam transport system. Both uniform and inhomogeneous field Wien filters may be used simultaneously for spin rotation and energy/mass analysis. The complete transfer matrix of a general inhomogeneous field Wien filter will be derived in a second order approximation. The matrix elements for the precession of the electron spin-polarization vector are included in a separate spin-rotation matrix. Real entrance and exit fringing fields are included for the specialized case of a Wien filter with curved and normal (not inclined) entrance and exit pole faces. The transfer matrices will be parameterized in terms of beam parameters and the multipole expansion coefficients of the filter's electric and magnetic fields.

00,588
PB93-165991 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Atomic and Plasma Radiation Div.
Higher-Order Vacuum Polarization Corrections in Muonic Atoms.
Final rept.
J. M. Schmidt, P. J. Mohr, and G. Soff. 1989, 4p.
See also DE88756945.
Pub. in Physical Review A 40, n4 p2176-2179 1989.

Keywords: *Muonic atoms, Vacuum polarization, Quantum electrodynamics, Energy levels, Corrections, Reprints.

Energy shifts in muonic atoms caused by vacuum polarization of order alpha(Z(alpha))(sup n) with n = or > 3 are calculated. Nuclear size corrections are taken into account. The calculations are performed for all muonic levels from the 1s(1/2)-state to the 5g(9/2)-state in various atoms with nuclear charge Z between 30 and 100.

00,589
PB93-166155 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Atomic and Plasma Radiation Div.
Influence of Vacuum Polarization Corrections of Order alpha(z(alpha)) and alpha(z(alpha))(sup 3) in Hydrogen-Like Uranium.
Final rept.
G. Soff, and P. J. Mohr. 1989, 2p.
See also DE88756940.
Pub. in Physical Review A 40, n4 p2174-2175 1989.

Keywords: *Uranium, Quantum electrodynamics, Rydberg states, Vacuum polarization, Energy levels, Reprints, *Hydrogen-like ions, Uehling potential, Wichmann-Kroll correction.

Energy shifts of a bound electron in hydrogen-like uranium due to vacuum polarization corrections of order alpha(z(alpha)) and alpha(z(alpha))(sup 3) are calculated. It is shown that for Rydberg levels, the higher-order Wichmann-Kroll correction of order alpha(z(alpha))(sup 3) is greater than the order alpha(z(alpha)) Uehling contribution.

00,590
PB93-166270 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Atomic and Plasma Radiation Div.
Spectroscopy of the 3s(2)3p(n) Shell from Cu to Mo.
Final rept.
J. Sugar. 1990, 7p.
Pub. in Verh. - K. Ned. Akad. Wet., Afd. Natuurkd., Eerste Reeks, v33 p184-190 1990.

Keywords: *Isoelectronic sequence, *M1-transitions, Arsenic, Bromine, Copper, Gallium, Germanium, Krypton, Molybdenum, Niobium, Rubidium, Selenium, Strontium, Yttrium, Zinc, Zirconium, Spectroscopy, Tables(Data), Reviews, Reprints.

The 3s(2)3p(n) Isoelectronic sequences from Cu to Mo have been actively investigated in the past 15 years because of the importance of these spectra for tokamak plasma diagnostics. Many magnetic dipole transitions within these configurations were identified in tokamak plasmas even before anything was known of many of these ions. The authors give a brief review of the major spectroscopic studies that have been carried out with these ions. Revised tables of M1 lines for the isoelectronic sequences 3s(2)3p(2) and 3s(2)3p(4) from Cu to Mo are given.

00,591
PB93-166320 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Surface Science Div.
Material Dependence of Electron Inelastic Mean Free Paths at Low Energies.
Final rept.
S. Tanuma, C. J. Powell, and D. R. Penn. 1990, 4p.
Pub. in Jnl. of Vacuum Science and Technology A 8, n3 p2213-2216 1990.

Keywords: *Electron collisions, *Mean free path, *Aluminum, *Gold, Inelastic scattering, Electron scattering, Energy dependence, EV range 10-100, EV range 100-1000, KeV range 1-10, Attenuation, Reprints.

The authors have calculated electron inelastic mean free paths (IMFPs) for 50-2000 eV electrons in 31 materials (27 elements and 4 compounds). The authors present and discuss in the paper IMFP data for aluminum and gold in the 50-200 eV range. Substantial differences are found in the shapes of the IMFP versus energy curves and these can be understood in terms of the different inelastic scattering mechanisms in the two metals. The minimum IMFP value occurs at 40 eV in aluminum and at 120 eV in gold, a result which is consistent with the trends expected from free-electron IMFP calculations. This result differs, however, from that expected from the Seah and Dench attenuation length formula, which shows essentially no material dependence at low energies. The authors have extended a general formula derived earlier to describe the calculated IMFPs over the 200-2000 eV energy range to give the IMFP dependences on material and energy from 50 to 2000 eV.

00,592
PB93-166353 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Center for Atomic, Molecular and Optical Physics.
Constants, Fundamental.
Final rept.
B. N. Taylor. 1991, 11p.
Pub. in Encyclopedia of Physics, p180-190 1991.

Keywords: *Fundamental constants, Sommerfeld constant, Josephson effect, Least squares method, Quantum electrodynamics, Electron spin, Magnetic moments, Anomalies, Adjusting, Reprints, Quantum Hall effect, Fine structure constant.

The article touches upon four main topics: (1) the motivation for 'the romance of the next decimal place,' or why the fundamental physical constants are important and why their determination to ever greater levels of accuracy can have a profound effect on physics; (2) how a self-consistent set of 'best values' of the fundamental constants is obtained with emphasis on the 1986 least-squares adjustment of the constants (the most recent comprehensive study carried out); (3) new developments in the fundamental constants field since the 1986 adjustment was completed and their impact on the recommended set of best values resulting from that adjustment; and (4) future trends - where the field is heading over the next five to ten years.

00,593
PB93-166361 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Center for Atomic, Molecular and Optical Physics.
New International Volt and Ohm Standards.
Final rept.
B. N. Taylor. 1989, 5p.
See also PB89-184097.
Pub. in Proceedings of International Symposium on Electromagnetic Metrology, Beijing, P.R.C., August 19-22, 1989, p143-147.

Keywords: *Standards, Metrology, Josephson effect, International agreements, Reprints, *Resistance standards, *Voltage standards, *Volt, *Ohm, Quantum Hall effect, Consultative Committee on Electricity.

The paper reviews the new internationally agreed upon volt and ohm reference standards based on the Josephson and quantum Hall effects that are to come into effect worldwide starting on January 1, 1990; and the method to be used by the national standards laboratories to report the results of calibrations performed with the new standards.

00,594
PB93-166379 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Center for Atomic, Molecular and Optical Physics.
Preparing for the New Volt and Ohm.
Final rept.
B. N. Taylor. 1989, 4p.
Pub. in IEEE (Institute of Electrical and Electronics Engineers) Spectrum 26, n7 p20-23 1989.

Keywords: *Standards, International agreements, Josephson effect, Capacitance, Metrology, Temperature measurement, Reprints, *Resistance standards, *Voltage standards, *Volt, *Ohm, Quantum Hall effect, Farad.

The paper discusses the newly established and internationally adopted representations of the volt and ohm based on the Josephson and quantum Hall effects, respectively, that are to come into effect worldwide starting January 1, 1990. It also provides some general guidelines and instructions on how to bring laboratory reference standards of voltage and resistance and related instrumentation into conformity with the new representations. Also covered is the effect on electrical standards of the January 1, 1990 replacement of the International Practical Temperature Scale of 1968 by the International Temperature Scale of 1990; and of the January 1, 1990 change in the U.S. representation of the Farad.

00,595
PB93-166387 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Thermophysics Div.
Probes of Equipartition in Nonlinear Hamiltonian Systems.
Final rept.
D. Thirumalai, and R. D. Mountain. 1989, 23p.
See also N85-29668.
Pub. in Jnl. of Statistical Physics 57, n3-4 p789-801 1989.

Keywords: Ergodic processes, Nonlinear systems, Time dependence, Dynamical systems, Reprints, *Equipartition, FPU model, Nonlinear oscillations.

The time scales for equipartition to be reached is studied using a generalization of the recently introduced measure of ergodicity in liquids. The beta-Fermi-Pasta-Ulam model is chosen as an illustration. The measures are constructed by following the evolution of the systems using two independent initial conditions. The time averaged property of an observable is calculated using the two dynamical trajectories. The measure is essentially the norm in the space of the observable obtained from the two trajectories. The authors have shown that the time dependent behavior is a good indicator of the equipartition in large nonlinear systems. The numerical results show that equipartitioning critically depends on the initial conditions, and even when mode mixing occurs, the time scales appear to be extremely long.

00,596
PB93-166528 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Detection of S2F10 Produced by Electrical Discharge in SF6.
Final rept.
R. J. Van Brunt, J. K. Olthoff, I. Sauers, F. Y. Chu, H. D. Morrison, and J. R. Robins. 1992, 4p.
See also PB89-231039 and PB92-171693. Sponsored by Department of Energy, Washington, DC. Office of Energy Storage and Distribution, and Electric Power Research Inst., Palo Alto, CA.
Pub. in Proceedings of International Conference on Gas Discharges and Their Applications (10th), Swansea, UK., September 13-18, 1992, p418-421.

Keywords: *Electric discharges, *Gas discharges, *Arc discharges, *Corona discharges, *Sulfur hexafluoride, Concentration(Composition), Gas chromatography, Infrared spectroscopy, Absorption spectroscopy, Mass spectroscopy, Reprints, Disulfurdecafluoride.

Three methods for measuring the concentration of S2F10 in SF6 are briefly described. These are: (1) a gas chromatograph-mass spectrometer equipped with a thermal conversion tube, (2) a gas chromatograph coupled with an electron-capture detector and a gas enrichment process, and (3) an infrared absorption technique. The above techniques were used to investigate the production of S2F10 from dc-corona discharges and power arcs. The measured yields of S2F10 from corona were found to be quite reproducible thus suggesting the possibility of using this type of discharge to generate 'reference' gas samples that contain known quantities of S2F10 in SF6. The relative yield of S2F10 from power arcs is found to be very low compared with the yields of other stable by-products such as SOF2, which was expected from the low thermal stability of S2F10.

00,597
PB93-166635 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Quantum Metrology Div.
Measurement of (3)He(n,gamma)(4)He Cross-Section at Thermal Neutron Energies.
Final rept.
F. L. H. Wolfs, G. L. Greene, M. S. Dewey, S. J. Freedman, and J. E. Nelson. 1989, 4p.
Pub. in Physical Review Letters 63, n25 p2721-2724 1989.

Keywords: *Helium 3 target, *Neutron capture, *Neutron cross sections, Solar neutrinos, Proton reactions, Measurement, Reprints, Radiative capture.

The authors have measured the cross-section for radiative capture of thermal neutrons on (3)He. The measured cross-section of 54 + or - 7 micro(b) is used to estimate the astrophysical S-factor for the reaction (3)He(p,e + nu)(4)He which gives rise to high energy neutrinos from the sun.

00,598
PB93-166817 PC A08/MF A02
National Inst. of Standards and Technology, Gaithersburg, MD.
Journal of Research of the National Institute of Standards and Technology, January-February 1993. Volume 98, Number 1. Special Issue.
1993, 163p.
Also available from Supt. of Docs. as SN703-027-00050-4. See also PB93-166825 through PB93-166916 and PB93-143923.

Keywords: *Neutron scattering, *Neutron spectrometers, *Research facilities, Time-of-flight spectrometers, Condensed matter physics, Cold neutrons, Small angle scattering, Neutron diffraction, Neutron spectrometers, Neutron spectroscopy, Neutron physics, Surface analysis, Activation analysis, NBSR reactor, Uses, *Cold Neutron Research Facility, *CNRF facility, Neutron depth profiling, Depth profiles, US NIST.

Contents:
- The NIST Cold Neutron Research Facility;
- Outline of Neutron Scattering Formalism;
- Small Angle Neutron Scattering at the National Institute of Standards and Technology;
- Neutron Reflectivity and Grazing Angle Diffraction;
- The Triple Axis and SPINS Spectrometers;
- Neutron Time-of-Flight Spectroscopy;
- Ultra-High Resolution Inelastic Neutron Scattering;
- Neutron Depth Profiling:
- Overview and Description of NIST Facilities;
- Prompt-Gamma Activation Analysis;
- Facilities for Fundamental Neutron Physics Research at the NIST Cold Neutron Research Facility.

00,599
PB93-166825 (Order as PB93-166817, PC A08)
National Inst. of Standards and Technology, Gaithersburg, MD.
NIST Cold Neutron Research Facility.
H. J. Prask, J. M. Rowe, J. J. Rush, and I. G. Schroder. 1993, 13p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n1 p1-13 Jan/Feb 93.

Keywords: *Research facilities, *Cold neutrons, Neutron guides, Neutron detectors, Neutron sources, NBSR reactor, Research reactors, *CNRF facility, US NIST.

The Cold Neutron Research Facility (CNRF) at the National Institute of Standards and Technology (NIST) Research Reactor (NBSR) is now coming on line, with the first seven experimental stations operational, and more stations scheduled to be installed during 1992. The present article provides an introduction to the facility, and to other articles in the current issue that give more details on some of the research opportunities that the facility will bring to NIST.

00,600
PB93-166833 (Order as PB93-166817, PC A08)
National Inst. of Standards and Technology, Gaithersburg, MD.
Outline of Neutron Scattering Formalism.
N. F. Berk. 1993, 16p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n1 p15-30 Jan/Feb 93.

Keywords: *Neutron scattering, Small angle scattering, Quasi-elastic scattering, Van Hove theory, Born approximation, Inelastic scattering, Elastic scattering, Sum rules, Neutron reflection.

Neutron scattering formalism is briefly surveyed. Topics touched upon include coherent and incoherent scattering, bound and free cross-sections, the Van Hove formalism, magnetic scattering, elastic scattering, the static approximation, sum rules, small angle scattering, inelastic scattering, thermal diffuse scattering, quasielastic scattering, and neutron optics.

00,601
PB93-166841 (Order as PB93-166817, PC A08)
National Inst. of Standards and Technology, Gaithersburg, MD.
Small Angle Neutron Scattering at the National Institute of Standards and Technology.
B. Hammouda, S. Krueger, and C. J. Glinka. 1993, 16p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n1 p31-46 Jan/Feb 93.

Keywords: *Small angle scattering, *Neutron scattering, Neutron spectrometers, Macromolecules, Microstructure, Polymers, Ceramics, Metals, Alloys, Complexes, DNA, Uses, US NIST.

The small angle neutron scattering technique is a valuable method for the characterization of morphology of various materials. It can probe inhomogeneities in the sample (whether occurring naturally or introduced through isotopic substitution) at a length scale from the atomic size (nanometers) to the macroscopic (micrometers) size. The work provides an overview of the small angle neutron scattering facilities at the National Institute of Standards and Technology and a review of the technique as it has been applied to polymer systems, biological macromolecules, ceramic, and metallic materials. Specific examples have been included.

00,602
PB93-166866 (Order as PB93-166817, PC A08)
Army Armament Research, Development and Engineering Center, Dover, NJ.
Triple Axis and SPINS Spectrometers.
S. F. Trevino. 1993, 11p.
Prepared in cooperation with National Inst. of Standards and Technology, Gaithersburg, MD.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n1 p59-69 Jan/Feb 93.

Keywords: *Neutron spectrometers, Condensed matter physics, Polarized beams, Magnetic materials, Neutron scattering, Inelastic scattering, Physical chemistry, Hydrogen, Phonons, Uses, SPINS spectrometer, Triple axis spectrometers, Rotational diffusion, CNRF facility.

In the paper are described the triple axis and spin polarized inelastic neutron scattering (SPINS) spectrometers which are installed at the NIST Cold Neutron Research Facility (CNRF). The general principle of operation of these two instruments is described in sufficient detail to allow the reader to make an informed decision as to their usefulness for his needs. However, it is the intention of the staff at the CNRF to provide the expert resources for their efficient use in any given situation. Thus, the work is not intended as a user manual but rather as a guide into the range of applicability of the two instruments.

00,603
PB93-166874 (Order as PB93-166817, PC A08)
National Inst. of Standards and Technology, Gaithersburg, MD.
Neutron Time-of-Flight Spectroscopy.
J. R. D. Copley, and T. J. Udovic. 1993, 17p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n1 p71-87 Jan/Feb 93.

Keywords: *Time-of-flight spectrometrs, *Neutron spectroscopy, Time-of-flight method, Quasi-elastic scattering, Inelastic scattering, Neutron scattering, Neutron choppers, Vibrational spectra, Magnetic semiconductors, Hydrogen, Diffusion, Uses, Tunneling spectroscopy, CNRF facility.

The time-of-flight technique is employed in two of the instruments at the NIST Cold Neutron Research Facility (CNRF). A pulsed monochromatic beam strikes the sample, and the energies of scattered neutrons are determined from their times-of-flight to an array of detectors. The time-of-flight method may be used in a variety of types of experiments such as studies of vibrational and magnetic excitations, tunneling spectroscopy, and quasielastic scattering studies of diffusional behavior; several examples of experiments are discussed. The authors also present brief descriptions of the CNRF time-of-flight instruments, including their modi operandi and some of their more pertinent parameters and performance characteristics.

00,604
PB93-166882 (Order as PB93-166718, PC A08)
National Inst. of Standards and Technology, Gaithersburg, MD.
Ultra-High Resolution Inelastic Neutron Scattering.
D. A. Neumann, and B. Hammouda. 1993, 20p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n1 p89-108 Jan/Feb 93.

Keywords: *Neutron scattering, *Neutron spectrometers, Quasi-elastic scattering, Inelastic scattering, High resolution, Cold neutrons, Spin echo, Backscattering, Dynamics, Diffusion, Polymers, Benzene, Uses, Molecular orientation, Rotational tunneling, Tunneling spectroscopy, CNRF facility.

Two types of ultra high energy resolution neutron scattering instruments, the backscattering spectrometer and the spin echo spectrometer, are described. Examples of the types of research which can be done with these instruments are given and plans for a cold neutron backscattering spectrometer which will be built in the NIST Cold Neutron Research Facility (CNRF) are discussed. It is hoped that the information will be of use to researchers considering neutron scattering experiments at NIST.

00,605
PB93-166916 (Order as PB93-166817, PC A08)
National Inst. of Standards and Technology, Gaithersburg, MD.
Facilities for Fundamental Neutron Physics Research at the NIST Cold Neutron Research Facility.
M. Arif, M. S. Dewey, G. L. Greene, and W. M. Snow. 1993, 10p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n1 p135-144 Jan/Feb 93.

Keywords: *Research facilities, *Neutron physics, Neutron lifetime, Neutron decay, Vibration isolators, Monochromataors, Interferometers, Beta decay, Neutron interferometry, Neutron waves, CNRF facility.

The features of two fundamental neutron physics research stations at the NIST Cold Neutron Research Facility are described in some detail. A list of proposed initial experimental programs for these two stations is also given.

00,606
PB93-173433 PC A13/MF A03
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Atomic Physics Div.
Bibliography on Atomic Line Shapes and Shifts (July 1978 through March 1992) (Supplement 4).
Special pub.
J. R. Fuhr, and A. Lesage. Jan 93, 300p, NIST/SP-366-SUPPL-4.
Also available from Supt. of Docs. as SN003-003-03203-4. See also PB-289 815. Prepared in cooperation with Observatoire de Paris, Meudon (France).

Keywords: *Atomic spectra, *Bibliographies, Van der Waals forces, Stark effect, Line broadening, Line shape, Line spectra, Pressure broadening, Multicharged Ions, Resonance broadening.

This is the fourth supplement to the original NBS Special Publication 366, Bibliography on Atomic Line Shapes and Shifts (1889 through March 1972). It contains 1964 references and covers the literature from July 1978 to March 1992. As in the authors' previous publications, the bibliography consists of five major parts: (1) Part 1 is a section containing papers of general interest, many without numerical data. These papers are catalogued according to the broadening mechanisms. (2) In Part 2, all papers containing numerical data are ordered according to element, ionization stage, and broadening mechanism. (3) While in the two preceding parts of the bibliography the references are listed for brevity by identification numbers only, in Part 3 all references are listed completely by journal, authors, and title. In addition, the papers are arranged by year of publication and alphabetically by the first author's name within the year. (4) Part 4 contains a listing of all authors and their papers, as identified by the reference numbers from Part 3. (5) Part 5 provides corrections and/or additions to the third supplement of the original bibliography.

00,607
PB93-178648 PC A10/MF A03
National Inst. of Standards and Technology (PL), Gaithersburg, MD.
Physics Laboratory Technical Activities, 1992.
Mar 93, 219p, NISTIR-5133.
Presented to the Board on Assessment of NIST Programs, National Research Council, May 3-4, 1993. See also PB92-172824.

Keywords: *Physics, Atomic physics, Molecular physics, Fundamental constants, Frequency standards, Time standards, Quantum theory, Ionizing radiation, Metrology, Radiometry, Calibration, Optics, Electrons, Measurement, Progress report, Standard reference materials, US NIST.

The report summarizes research projects, measurement method development, calibration and testing, and data evaluation activities that were carried out during calendar year 1992 in the NIST Physics Laboratory. These activities fall in the areas of electron and optical physics, atomic physics, molecular physics, radiometric physics, quantum metrology, ionizing radiation, time and frequency, quantum physics, and fundamental constants.

00,608
PB93-181881 PC A04/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Statistical Engineering Div.
Surveillance Schemes with Applications to Mass Calibration.
M. Pollak, C. Croarkin, and C. Hagwood. Apr 93, 74p, NISTIR-5158.

Keywords: *Calibration, *Standards, Standard deviation, Nonparametric statistics, Computer programs, Control charts, Surveillance, Measurement, Mean, *Mass standards, Shiryayev-Roberts method, US NIST.

One of the activities at the NIST is calibrating mass standards. In order to ensure the quality of calibration, the NIST personnel monitor the values of check standards over time. The current standard surveillance technique is a Shewhart control chart with 3 sigma limits. Here we explore the applicability of other, recently developed, control charts. While Shewhart charts are typically designed to detect large changes, the schemes regarded here are geared towards detecting medium-sized ones. Some of these procedures are parametric, others are nonparametric. They are applied here to a sequence of measurements of mass standards, made at the NIST over a period of time. Two types of surveillance problems are regarded: monitoring for a change in mean and monitoring for a change of standard deviation. The control charts considered are shown to be effective.

00,609
PB93-189421 PC A06/MF A02
Maryland Univ., College Park. Dept. of Mechanical Engineering.
Transient Cooling of a Hot Surface by Droplets Evaporation. Final Report, November 1990.
P. Tartarini, Y. Liao, and M. di Marzo. Apr 93, 104p, NIST/GCR-93/622.
Grant 70NANB8H0840
See also PB90-227968. Sponsored by National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.

Keywords: *Droplets, *Evaporation, *Cooling, *Surfaces, Heat transfer, Experimental data, Water, Thermal conductivity, Vaporizing, Temperature measurement, Test facilities, Mathematical models.

A new experimental set-up for the study of dropwise evaporation in a radiant heat transfer field has been designed, constructed and tested. The various issues of concern such as: steady state solid temperature distribution, radiant heater design and configuration, infrared background noise and post test data manipulation are outlined. The formulation of a model for the prediction of the cooling induced by an evaporating droplet impinging a semi-infinite solid is the subject of the report. A combined Boundary Element Method (BEM) and Control Volume Method (CVM) has been used to solve this complex numerical problem. The results for both high and low thermal conductivity materials are in excellent agreement with the experimental findings. Detailed comparison of the surface temperature distributions on solid Macor detected with infrared thermography are also performed to demonstrate the accuracy of the computational method.

00,610
PB93-189868 PC A06/MF A02
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Ionizing Radiation Div.
ENDF/B-VI Neutron Cross Section Measurement Standards.
A. D. Carlson, W. P. Poenitz, G. M. Hale, C. Y. Fu, W. Mannhart, R. W. Peelle, and D. C. Dodder. May 93, 109p, NISTIR-5177.
See also PB86-229713 and PB92-159128. Prepared in cooperation with Argonne National Lab., IL., Los Alamos National Lab., NM., and Oak Ridge National Lab., TN. Sponsored by Department of Energy, Washington, DC.

Keywords: *Neutron cross sections, *Neutron reactions, *Nuclear data collections, *Standards, Boron 10 target, Lithium 6 target, Hydrogen 1 target, Hellum 3 target, Uranium 235 target, Carbon, Gold, R matrix, Neutron spectra, Californium 252, Spontaneous fission, Tables(Data), Graphs(Charts).

The document provides information on the neutron cross section standards placed in the ENDF/B-VI library. The H(n,n), (3)He(n,p), and C(n,n) cross sections were each obtained from well established R-matrix analysis techniques. The additional standards, i.e., the (6)Li(n,t), (10)B(n,alpha), (10)B(n, alpha 1), Au(n,gamma), and (235)U(n,f) cross sections were obtained with a new method. The new method involves combining the results of a simultaneous evaluation and R-matrix analyses. Contained herein is a discussion of the development of the method, a description of the evaluation process, some information on the various experiments used in the analyses, comparisons of the R-matrix, simultaneous evaluation and combination results, and comparisons to ENDF/B-V. Tables of numerical data are given for each of the cross section standards. Also, the new ENDF/B-VI evaluation for the spontaneous fission neutron spectrum for (252)Cf is given.

00,611
PB93-190338 PC A99/MF A06
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Process Measurements Div.
Temperature-Electromotive Force Reference Functions and Tables for the Letter-Designated Thermocouple Types Based on the ITS-90.
G. W. Burns, M. G. Scroger, G. F. Strouse, M. C. Croarkin, and W. F. Guthrie. Apr 93, 636p, NIST/MONO-175.
Supersedes COM-74-50351. Also available from Supt. of Docs. as SN003-003-03214-0. See also PB91-112854.

Keywords: *Temperature measurement, *Thermocouples, Guidelines, Calibration, Standards, Thermometers, *ITS-90, *International Temperature Scale of 1990.

The International Temperature Scale of 1990 (ITS-90) and the new representation of the volt came into effect on 1 January 1990. Those changes required that the then-existing IPTS-68 based temperature-electromotive force reference functions and tables for thermocouples be revised to give values in terms of the ITS-90 and the SI volt. This monograph gives the new reference functions and tables for the eight letter-designated thermocouple types: noble-metal types B, R, and S; and base-metal types E, J, K, N, and T. Also, for these thermocouple types, reference functions and tables of their thermoelements versus the NIST platinum thermoelectric reference standard, Pt-67, are given. The computational methods used to derive each of the new reference functions are described.

00,612
PB93-196285 (Order as PB93-196228, PC A07/MF A02)
National Inst. of Standards and Technology, Gaithersburg, MD.
Three-Ratio Scheme for the Measurement of Isotopic Ratios of Silicon.
H. Ku, F. Schaefer, S. Valkiers, and P. De Bievre. 1993, 5p.
Prepared in cooperation with Commission of the European Communities, Geel (Belgium). Inst. for Reference Materials and Measurements.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n2 p225-229 Mar/Apr 93.

Keywords: *Silicon, *Atomic weights, *Isotope ratio, Mass spectroscopy, Measurement.

The paper proposes a scheme of measurement sequences that has been used for the redetermination of the molar mass (atomic weight) of silicon at the Central Bureau for Nuclear Measurements (now Institute for Reference Materials and Measurements). This scheme avoids correlations among the measured ratios caused by normalizing all ion current measurements to that of the largest ion current. It also provides additional information for checking on the consistency of these ratios within a cycle of scans. Measurements of isotope abundance ratios of silicon are used as an illustration.

00,613
PB93-198463 PC A06/MF A02
Maryland Univ., College Park. Dept. of Mechanical Engineering.
Experimental Study of Multiple Droplet Evaporative Cooling.
Final rept.
H. Dawson, and M. di Marzo. Apr 93, 115p, REPT-92-1, NIST/GCR-93/624.
Grant 70NANB1H1173
Sponsored by National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.

Keywords: *Evaporative cooling, *Drops(Liquids), Mass transfer, Heat transfer, Surface temperature, Experimental data, Mathematical models, Test facilities, Data acquisition, Computer codes, Data analysis, Infrared thermography.

The purpose of the experimental study was to quantify the transient evaporative cooling of a radiantly heated, low thermal conductivity material subject to a random impingement of water droplets. Specifically, the transient behavior and spatial distribution of the surface temperature were investigated over a range of initial surface temperatures and impinging mass fluxes. Additionally, it was desired to draw some conclusions about the important parameters in the evaporative cooling phenomenon, and about evaporative cooling generally. A concurrent goal of the research was to continue development of the infrared thermography and digital image analysis techniques and equipment employed in the data acquisition system.

00,614
PB93-207512 PC A06/MF A02
National Inst. of Standards and Technology (PL), Gaithersburg, MD. Ionizing Radiation Div.
Elastic Scattering of Electrons and Positrons by Atoms: Database ELAST.
M. J. Berger, S. M. Seltzer, R. Wang, and A. Schechter. May 93, 104p, NISTIR-5188.
Sponsored by Department of Energy, Washington, DC. Office of Health and Environmental Research.

Keywords: *Electron-atom collisions, *Positron-atom collisions, *Data bases, Differential cross sections, Total cross sections, Transport cross sections, KeV range 01-10, KeV range 10-100, KeV range 100-1000, MeV range 01-10, Elastic scattering, Electron scattering, Tables(Data), ELAST database.

Database ELAST consists of cross sections for the elastic scattering of electrons and positrons by atoms. ELAST includes differential, total and transport cross sections, for scattering targets with atomic numbers Z from 1 to 100, at selected energies from 1 keV to 1024 keV. The cross sections were calculated with a computer code of Riley, based on the partial-wave expansion method. The electrons and positrons were assumed to be scattered by static, screened Coulomb potentials. Screening was calculated with the use of density distributions of atomic electrons obtained with a relativistic Dirac-Fock wave-function program of Desclaux. An interpolation program is included with which one can obtain elastic scattering cross sections at any energy between 1 keV and 1024 keV. Cross section tables for electrons are presented for 23 elements at 27 energies between 1 MeV and 1 keV.

00,615
PB93-208494 PC A03/MF A01
National Inst. of Standards and Technology (PL), Gaithersburg, MD.
Chaos, Dissipation, Arrow of Time, in Quantum Physics.
Technical note.
M. Danos. May 93, 14p, NIST/TN-1403.
Also available from Supt. of Docs. as SN003-003-03216-6.

Keywords: *Quantum theory, Hamiltonian functions, T invariance, Thermodynamics, Dissipation, Entropy, Quantum chaos.

A compact description of the evolution of a many-body system, e.g., a dilute gas, is provided by the generalization of the usual reaction S-matrix or U-matrix to a system S- or U-matrix. Using this tool it is demonstrated, that (i) the characterization of quantum chaos turns out to be very transparent: already exceedingly simple systems, including time-reversal invariant states, are capable of exhibiting quantum chaos; (ii) the time-reversal invariance of the Hamiltonian leads to relaxation of arbitrary non-equilibrium states of chaotic quantum systems, i.e., to dissipation, which thus allows the definition of a quantum arrow of time; (iii) the second law of thermodynamics, and hence the complete field of thermodynamics, is a consequence of quantum physics.

00,616
PB94-108479 (Order as PB94-108461, PC A09/MF A02)
National Inst. of Standards and Technology, Gaithersburg, MD.
Coil Probe Dimension and Uncertainties during Measurements of Nonuniform ELF Magnetic Fields.
M. Misakian. 1993, 9p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n3 p287-295 May/Jun 93.

Keywords: *Magnetic measurement, *Magnetic probes, Extremely low frequency, Electric appliances, Residential buildings, Transportation systems, Working conditions, Magnetic fields, Magnetic flux, Pollution sources, Measurement uncertainty.

Comparisons are made between the calculated average magnetic flux density for single-axis and three-axis circular coil probes and the calculated magnetic flux density at the center of the probes. The results, which are determined assuming a dipole magnetic field, provide information on the uncertainty associated with measurements of nonuniform extremely low frequency (ELF) magnetic fields produced by some electrical appliances and other electrical equipment.

00,617
PB94-118494 PC A05/MF A01
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Thermophysics Div.
Thermodynamic Properties of Homogeneous Mixtures of Nitrogen and Water from 440 to 1000 K, Up to 100 MPa and 0.8 Mole Fraction N2.
Technical note.
J. S. Gallagher, J. M. H. L. Sengers, I. M. Abdulagatov, J. T. R. Watson, and A. Fenghour. Aug 93, 80p, NIST/TN-1404.
Also available from Supt. of Docs. as SN003-003-03228-0. See also PB87-109948. Prepared in cooperation with Akademiya Nauk SSSR, Makhachkala. Inst. of Geothermic Problems of the Dagestan, and National Engineering Lab., East Kilbride (Scotland).

Keywords: *Thermodynamic properties, *Mixtures, *Nitrogen, *Water, Solubility, Henrys law, Specific heat, Tables(Data), Enthalpy, Pressure, Density(Mass/volume).

A generalized corresponding-states model of the Helmholtz free energy for fluid mixtures, with pure water as the reference fluid, has been used to model the solubility and thermodynamic properties of nitrogen in water in homogeneous states in a wide range of temperatures and pressures around the water critical point. The model predictions are compared with the literature data available in this range. Tabulated values of density, enthalpy, isobaric heat capacity and fugacity coefficients are presented at selected entries of pressure from 0.05 to 100 MPa, of temperature from 440 to 1000 K, and of nitrogen mole fractions up to 0.8. Also presented are tables of infinite-dilution (standard-state) properties of the nitrogen solute in the same pressure and temperature range.

Acoustics

00,618
PB93-152064 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Automated Production Technology Div.

Acoustics

ONR-Sponsored Research in Ultrasonic Measurements at NIST: 1982-92.
N. N. Hsu, G. V. Blessing, and F. R. Breckenridge.
Dec 92, 13p, NISTIR-5101.
See also PB82-229345. Sponsored by Office of Naval Research, Arlington, VA. Physics Div.

Keywords: *Acoustic measurement, *Acoustic emissions, *Ultrasonic tests, Acoustic detection, Greens function, Ultrasonic radiation, Calibration, Transducers, Sources, Inverse problems, Deconvolution.

The report summarizes the research in ultrasonic measurements at the National Institute of Standards and Technology (NIST) which was supported in part by the Physics Division of the Office of Naval Research from 1982 to 1992. This represents work accomplished since the last such summary report, NBSIR 82-2529, entitled 'Ultrasonic Research Summary Report and Literature Guide to the National Bureau of Standards/Office of Naval Research Program.' References to the published literature documenting the new work are included.

Fluid Mechanics

00,619
DE93007991 PC A02/MF A01
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD.
Estimation of droplet collision frequency in a spray.
J. R. Zurlo, C. Presser, and H. G. Semerjian. 1992, 6p, CONF-9205307-1.
Contract AI01-86CE90213
ILASS-AMERICAS '92, San Ramon, CA (United States), 18-20 May 1992. Sponsored by Department of Energy, Washington, DC.

Keywords: *Droplets, *Sprays, Atomization, Collisions, Fluid Mechanics, Fuels, Polarization, Spherical Configuration, EDB/661300.

An estimate of droplet collision frequency was obtained in a pressure-atomized fuel spray. Measurement of the vertical linear depolarization ratio was used to provide information on droplet sphericity which in turn was used to determine droplet collision frequency. The results indicate that droplet collision frequency increases near the spray boundary where the droplet number density is a maximum.

00,620
N94-10103/7 (Order as N94-10070/8, PC A19/MF A04)
National Inst. of Standards and Technology, Gaithersburg, MD.
Effect of Gravity Modulation on Thermosolutal Convection.
B. V. Saunders, B. T. Murray, G. B. Mcfadden, S. R. Coriell, and A. A. Wheeler. cAug 92, 5p.
In Esa, Proceedings of the 8TH European Symposium on Materials and Fluid Sciences in Microgravity, Volume 1 p 237-241. Sponsored by NASA and Darpa.

Keywords: *Convection, *Directional solidification (Crystals), Floquet theorem, Flow stability, Gravitational effects, Reduced gravity, Solutes, Binary alloys, Prandtl number, Rayleigh number, Schmidt number, Thermomigration.

In a gravitational field, the opposing effects of components of different diffusivities, for example, temperature and solute, in the density profile in a fluid may produce convective instabilities that exhibit a broad range of dynamical behavior. The effect of time periodic vertical gravity modulation on the onset of these instabilities in an infinite horizontal layer with stress free boundaries is examined. This work is viewed as a first step in expanding previous results in solidification to the full problem of characterizing the effects of gravity modulation in thermosolutal convection during the directional solidification of binary alloys. Calculations carried out both with and without steady background acceleration are presented, the latter results being relevant to microgravity conditions.

00,621
PB93-166114 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Structures Div.
Chaotic Motions of Self-Excited Forced and Autonomous Square Prisms.
Final rept.
E. Simiu, and G. R. Cook. 1991, 1219p.
Pub. in Jnl. of Engineering Mechanics 117, n2 p241-259 Feb 91.

Keywords: *Aeroelasticity, *Wind loading, *Oscillating flow, Oscillators, Buffeting, Bluff bodies, Aerodynamics, Unsteady flow, Oscillations, Nonlinear systems, Chaos, Reprints.

The motion of oscillators governed by the standard equations for the aerodynamic galloping of square prisms is studied for two cases: a harmonically forced, single elastically mounted bar immersed in a uniform flow, and an autonomous, elastically coupled pair of such bars. It is shown that the behavior of the forced oscillator has similarities to the behavior of the standard circle map. Thus it is possible to describe how locked-in oscillatory forms are organized within the forcing amplitude/frequency parameter space and to identify transitions from quasiperiodicity to chaos and turbulent intermittencies. For the coupled pair of oscillators, two stable attractors were identified on which the orbits are topologically similar, respectively, to the two normal modes of the associated linear system. Depending upon the system parameters, one of the attractors contains orbits that may be periodic, quasiperiodic, or chaotic. Beyond a critical flow velocity this attractor vanishes. For the other attractor, only periodic orbits were identified. This work is the first stage of a numerical and experimental investigation aimed at assessing the potential role of chaotic dynamics in bluff body fluid elasticity, with a view to application in ocean engineering.

Optics & Lasers

00,622
PB93-125201 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Technology Div.
High Resolution Spectroscopy Using Fiber Lasers.
Final rept.
S. L. Gilbert. 1991, 6p.
Sponsored by Naval Sea Systems Command, Washington, DC.
Pub. in Proceedings of International Conference on Laser Spectroscopy (10th), Font-Romeu, France, June 17-21, 1991, p359-364.

Keywords: *Laser spectroscopy, Glass lasers, Tunable lasers, Frequency stability, Optical communication, High resolution, Doped materials, Erbium, Rubidium, Acetylene, Line width, Reprints, *Fiber lasers, Wavelength standards.

Fiber lasers show potential for use in high resolution laser spectroscopy. Tunable, single-longitudinal-mode operation has been achieved with free-running laser linewidths of about 1 MHz. It would be straightforward to obtain much narrower linewidths using low frequency electronic feedback. In this paper the author reviews this rapidly changing field, and discusses the use of fiber lasers in spectroscopy.

00,623
PB93-125714 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Precision Engineering Div.
Direct and Inverse Problems for Light Scattered by Rough Surfaces.
Final rept.
E. Marx, and T. V. Vorburger. 1990, 14p.
Pub. in Applied Optics 29, n25 p3613-3626 1990.

Keywords: *Light scattering, *Surface roughness, Least squares method, Angular distribution, One dimensional, Autocorrelation, Profiles, Reprints, Inverse problems, Random surfaces, Profilometry.

Calculations are performed to relate the stylus profile of a one-dimensionally rough surface to the angular distribution of the light scattered by such a surface. In the direct problem, the angular distribution of the scattered light calculated from the profile is shown to agree with the measured one. In the inverse problem, the rms roughness and the autocorrelation function are found by a least-squares fit to the measured angular distribution. For the smoother surfaces, the rms roughness is mostly determined by the ratio between the power of the specular beam and the total power of the scattered light; the computed values are proportional to those calculated directly from the stylus profiles. The values of the parameters obtained by the least-squares fit are affected by a variety of errors and agree only partially with those obtained from the stylus profile.

00,624
PB93-143964 (Order as PB93-143923, PC A06/MF A02)
National Inst. of Standards and Technology, Gaithersburg, MD.
Accuracy of the Double Variation Technique of Refractive Index Measurement.
J. R. Verkouteren, E. B. Steel, E. S. Windsor, and J. M. Phelps. 1992, 13p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v97 n6 p693-705 Nov/Dec 92.

Keywords: *Refractive index, Liquid immersion tests, Experimental design, Optical measurement, Polarized light, Error analysis, Transparence, Dispersion, Calibration, Accuracy, Asbestos, Minerals, Bias, *Double variation technique.

Errors in the double variation technique of refractive index measurement are analyzed using a new approach. The ability to measure matching wavelength is characterized, along with the effect on the calculated refractive index. Refractive index accuracy and precision are very dependent on the specifics of each calibration set, particularly the difference in dispersion between the liquid and solid. The best precision (+ or - 1 or 2 x 10(sup -4)) is attained only when the difference in dispersion between liquid and solid is small, and is dependent on an individual operator's ability to perceive changes in relief. The precision is impossible to achieve for the other glass/liquid combinations, where the authors are limited by a precision of approximately 1 nm in the selection of matching wavelength. A bias in the measurement of matching wavelength exists that affects the accuracy of the calculated refractive indices.

00,625
PB93-150811 Not available NTIS
National Inst. of Standards and Technology (MEL), Gaithersburg, MD. Precision Engineering Div.
Long-Range Scanning for Scanning Tunneling Microscopy.
Final rept.
J. Fu, R. D. Young, and T. V. Vorburger. 1992, 6p.
Pub. in Review of Scientific Instruments 63, n4 p2200-2205 Apr 92.

Keywords: *Scanning tunneling microscopy, *Microscopes, Disks(Shapes), Piezoelectricity, Linearity, Hysteresis, PZT, Reprints, Optical surfaces, Capacitance gages.

We report a scanning tunneling microscope (STM) with 500 micrometers x 500 micrometers field of view. It departs from past designs in that a long-range X-Y stage carries the specimen and scans while the STM head is held stationary. The STM head is capable of scanning with a range of 8 micrometers. Combining the capability of tip scanning and X-Y stage scanning yields a wide dynamic range and has useful applications for measuring optical surfaces.

00,626
PB93-153591 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Technology Div.
Reference Detectors for Spectral Responsivity Measurements.
Final rept.
R. J. Phelan, J. H. Lehman, and D. R. Larson. 1991, 8p.
Pub. in Proceedings of Measurement Science Conference Symposium and Workshop, Anaheim, CA., January 30-February 1, 1991, p1-8.

Keywords: Optical detectors, Performance evaluation, Measurement, Design, Uses, Reprints, *Reference detectors, Spectral responsivity.

The paper presents a view of the need, use, design, and evaluation of detectors to be used for spectral responsivity measurements. The emphasis is on a design that is easy to use and for which the spectral responsivity can be understood and confirmed by the user.

00,627
PB93-153757 Not available NTIS

National Inst. of Standards and Technology (NML), Gaithersburg, MD. Electron and Optical Physics Div.
Excitation-Energy Dependence in the L2,3 Fluorescence Spectrum of Si.
Final rept.
J. E. Rubensson, D. Mueller, R. Shuker, J. Jia, T. A. Callcott, D. L. Ederer, and C. H. Zhang. 1990, 4p.
Sponsored by National Science Foundation, Washington, DC., and Department of Energy, Washington, DC.
Pub. in Physical Review Letters 64, n9 p1047-1050, 26 Feb 90.

Keywords: *Silicon, Synchrotron radiation, Valence bands, Emission spectra, Fluorescence, Excitation, Reprints, X-ray emission.

The L(2,3) emission spectrum of c-Si, excited by monochromatized synchrotron radiation, has been recorded with a 5-m Rowland spectrometer. Dramatic spectral changes are observed as the excitation energy is varied from the 2p binding energy up to 144 eV. It is proposed that a spectator electron, close to the bottom of the conduction band, influences the emission spectrum. The observations suggest that interband shakeup is important in the excitation process, and that a population of low-lying levels, via initial-state shakeup, influences the high-energy-excited Si L emission spectrum.

00,628
PB93-166023 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Precision Engineering Div.
Scanning Tunneling Microscopy of Optical Surfaces.
Final rept.
J. Schneir, J. A. Dagata, H. H. Harary, H. B. Elswijk, J. Sauvageau, C. J. Evans, and A. J. Melmed. 1989, 10p.
Pub. in Proceedings of SPIE (Society of Photo-Optical Instrumentation Engineers) Surface Characterization and Testing II, San Diego, CA., August 10-11, 1989, v1164 p112-121.

Keywords: Scanning tunneling microscopy, Surface analysis, Silicon, Gold, Reprints, *Optical surfaces, Surface finish, Diamond turning.

The authors have imaged diamond turned gold surfaces and a gold coated silicon surface with the STM. In order to determine the reproducibility of the topographic information obtained with the STM, the authors imaged the same diamond turned gold surface with different tips. Both mechanically formed and electrochemically etched tips were used. Surface images observed with the STM varied from tip to tip for both methods of preparation. The use of the STM to image optical surfaces hinges on the ability to manufacture stable and reproducible tips.

00,629
PB93-166395 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Radiometric Physics Div.
Radiometer for Precision Coherent Radiation Measurements.
Final rept.
D. B. Thomas, and E. F. Zalewski. 1989, 7p.
See also PB92-217645.
Pub. in Proceedings of SPIE (Society of Photo-Optical Instrumentation Engineers) - Opt. Radiat. Meas. 2, v1109 p70-76 1992.

Keywords: *Radiometers, Visible radiation, Coherent radiation, Silicon diodes, Photodiodes, Reprints, Transfer standards.

A radiometer has been designed for precision coherent radiation measurements and tested for long term repeatability at wavelengths of 488 and 633 nm. The radiometer consists of a single high quality PN silicon photodiode maintained in a nitrogen atmosphere and a quartz window designed to eliminate interference problems. Ratio measurements between the radiometer and an absolute type detector were made over a period of 215 days. At 0.5 mW, the standard deviations (1 sigma) were 0.008 and 0.009% at 488 and 633 nm respectively. The maximum deviations from the mean were 0.016 and 0.015% at the respective wavelengths. The high precision, simplicity, and portability of the radiometer make it an excellent transfer standard for radiometric measurements.

00,630
PB93-166692 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Fitting of Transmission Data for Determining the Optical Constants and Thicknesses of Optical Films.
Final rept.
X. Ying, A. Feldman, and E. N. Farabaugh. 1990, 4p.
Pub. in Jnl. of Applied Physics 67, n4 p2056-2059 1990.

Keywords: *Refractive index, *Absorption coefficients, Light transmission, Curve fitting, Yttrium oxides, Silicon dioxide, Thin films, Film thickness, Inhomogeneity, Silica, Reprints, Extinction coefficients.

A multiparameter nonlinear curve fitting method is used to determine the refractive indices, absorption coefficients, and thicknesses of mixed yttria-silica films from transmittance spectra. Both homogeneous and inhomogeneous models of refractive index in the films are used for the data analysis. Results suggest that inhomogeneity in the films should be considered when investigating the optical properties of thin films. However, care must be taken when computing a refractive index gradient in an absorbing film as both phenomena can affect the optical transmittance in a similar manner.

00,631
PB93-196228 PC A07/MF A02
National Inst. of Standards and Technology, Gaithersburg, MD.
Journal of Research of the National Institute of Standards and Technology, March-April 1993. Volume 98, Number 2.
1993, 135p.
See also PB93-195236 through PB93-196293 and PB93-166817. Also available from Supt. of Docs. as SN703-027-00051-2.

Keywords: *Research, Argon plasma, Glow discharges, Reaction kinetics, Computerized simulation, Tiltmeters, Optical fibers, Fiber optics, Dimensional measurement, Instrument errors, Calibrating, Drift, Silicon, Atomic weights, Isotope ratio, Spectral shift, Wolf shifts, Claddings.

Contents:
- Absolute Spatially- and Temporally-Resolved Optical Emission Measurements of rf Glow Discharges in Argon;
- Optimizing Complex Kinetics Experiments Using Least-Squares Methods;
- Measuring Low Frequency Tilts;
- Optical Fiber Geometry--Accurate Measurement of Cladding Diameter;
- Drift Eliminating Designs for Non-Simultaneous Comparison Calibrations;
- A Three-Ratio Scheme for the Measurement of Isotopic Ratios of Silicon;
- 'Wolf Shifts' and Their Physical Interpretation Under Laboratory Conditions.

00,632
PB93-196269 (Order as PB93-196228, PC A07/MF A02)
National Inst. of Standards and Technology, Boulder, CO.
Optical Fiber Geometry: Accurate Measurement of Cladding Diameter.
M. Young, P. D. Hale, and S. E. Mechels. 1993, 14p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n2 p203-216 Mar/Apr 93.

Keywords: *Optical fibers, *Fiber optics, *Dimensional measurement, Video equipment, Gray scale, Micrometers, Diameters, Uncertainty, *Claddings, Standard reference materials, Scanning confocal microscopes, Interference microscopes, Video microscopes.

The authors have developed three instruments for accurate measurement of optical fiber cladding diameter: a contact micrometer, a scanning confocal microscope, and a white-light interference microscope. Each instrument has an estimated uncertainty (3 standard deviations) of 50 nm or less, but the confocal microscope may display a 20 nm systematic error as well. The micrometer is used to generate Standard Reference Materials that are commercially available.

00,633
PB93-196293 (Order as PB93-196228, PC A07/MF A02)
Alpine Lake Resort, Terra Alta, WV.
Wolf Shifts and Their Physical Interpretation under Laboratory Conditions.
K. D. Mielenz. 1993, 10p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n2 p231-240 Mar/Apr 93.

Keywords: *Spectral shift, Light transmission, Conservation laws, Spectroscopy, Radiometry, Diffraction, Coherence, Invariance, *Wolf shifts.

The paper attempts to reconcile conflicting points of view of laboratory physicists and coherence theorists on correlation-induced spectral changes arising from the partial coherence of primary and secondary light sources. It is shown that, under normal laboratory conditions and in the Fraunhofer approximation, the directional spectrum of light does not change on propagation in free space, and that each frequency component of the total spectrum is preserved in accordance with the principle of energy conservation. It is demonstrated, and illustrated by examples, that descriptions of diffraction by the theory of partial coherence and by classical wave optics are fully equivalent for incoherent primary sources. A statistical approach is essential, and coherence theory is required, for partially coherent primary sources.

Plasma Physics

00,634
PB93-153575 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Ion Kinetic-Energy Distributions and Electrical Measurements in Ar/O2 rf Glow Discharges.
Final rept.
J. K. Olthoff, R. J. Van Brunt, and M. A. Sobolewski. 1992, 4p.
Pub. in Proceedings of International Conference on Gas Discharges and Their Applications (10th), Swansea, UK, September 13-18, 1992, p440-443.

Keywords: *Glow discharges, Electrical measurement, Argon plasma, Kinetic energy, Impurities, Reprints, Oxygen plasma.

Ion kinetic-energy distributions and electrical characteristics were measured for a range of argon/oxygen rf plasmas. Correlations between the measurements are investigated. Dramatic changes in all of the measurements are observed when small amounts of oxygen are added to argon discharges, indicating the possible importance of impurities in rf plasma processing.

00,635
PB93-166569 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Energy Distribution Functions of Argon Ions in Low Current, Diffuse Discharges at High E/N.
Final rept.
S. B. Vrhovac, B. M. Jelenkovic, J. K. Olthoff, and R. J. Van Brunt. 1992, 3p.
Pub. in Proceedings of International Conference on Gas Discharges and Their Applications (10th), Swansea, UK., September 13-18, 1992, p510-512 1992.

Keywords: *Gas discharges, *Argon ions, Kinetic energy, Distribution functions, Direct current, Townsend discharge, Ion temperature, Mass spectroscopy, Reprints.

Kinetic-energy distributions are measured for ions sampled from diffuse, low-current, dc argon discharges at high E/N (electric field/gas density). Ion temperatures are calculated from the distributions and variations from a Maxwellian energy dependence are discussed.

00,636
PB93-196236 (Order as PB93-196228, PC A07/MF A02)
National Inst. of Standards and Technology, Gaithersburg, MD.
Absolute Spatially- and Temporally-Resolved Optical Emission Measurements of rf Glow Discharges in Argon.
S. Djurovic, J. R. Roberts, M. A. Sobolewski, and J. K. Olthoff. 1993, 22p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n2 p159-180 Mar/Apr 93.

Keywords: *Argon plasma, *Glow discharges, Radio frequency discharge, Emission spectra, Visible radiation.

Spatially- and temporally-resolved measurements of optical emission intensities are presented from rf dis-

charges in argon over a wide range of pressures (6.7 to 133 Pa) and applied rf voltages (75 to 200 V). Results of measurements of emission intensities are presented for both an atomic transition (Ar I, 750.4 nm) and an ionic transition (Ar II, 434.8 nm). All measurements were made in a well-defined rf reactor. They provide detailed characterization of local time-resolved plasma conditions suitable for the comparison with results from other experiments and theoretical models. These measurements represent a new level of detail in diagnostic measurements of rf plasmas, and provide insight into the electron transport properties of rf discharges.

Radiofrequency Waves

00,637
PB93-125631 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
Comments on 'Rapid Pulsed Microwave Propagation'.
Final rept.
R. B. Marks. 1992, 1p.
Pub. in IEEE (Institute of Electrical and Electronics Engineers) Microwave and Guide Wave Letters 2, n5 p204 May 92.

Keywords: *Microwave transmission, Electromagnetic pulses, Light speed, Maxwells equations, Phase velocity, Reprints.

The letter discusses a recently published letter that reports experimental evidence of electromagnetic pulses propagating faster than the speed of light. It argues that such results contradict Maxwell's equations. Limitations of the experiment are examined.

00,638
PB93-125706 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Precision Engineering Div.
Logarithmic Terms in Fields Near the Edge of a Dielectric Wedge.
Final rept.
E. Marx. 1990, 4p.
Pub. in Proceedings of Antennas and Propagation Symposium Digest, Dallas, TX., May 7-11, 1990, p1083-1086.

Keywords: *Electromagnetic fields, Helmholtz equations, Logarithm functions, Maxwells equations, Power series, Reprints, Dielectric wedges.

The fields in the presence of an infinite dielectric wedge can be expanded in a series that includes logarithmic terms. The form of the expansion depends on the wedge angle, and several examples are given.

00,639
PB93-220002 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Fields Div.
Selected EMC Standards and Regulations: A Summary.
M. T. Ma. Jul 93, 18p, NISTIR-5005.

Keywords: *Electromagnetic compatibility, *Regulations, Standards, Magnetic fields, Magnetic measurement, Electromagnetic fields.

The short report summarizes the objective, frequency range, allowable limits, required accuracy (if any), apparatus recommended, specific parameters involved, and measurement environment for some selected regulations and standards regarding electromagnetic compatibility measurements. These regulations and standards, either enforced by the U.S. Government agencies or incorporated in voluntary industrial practice, were reviewed and critiqued in 1992.

Solid State Physics

00,640
DE93002848 PC A06/MF A02
National Inst. of Standards and Technology, Boulder, CO.
Proceedings of the sixth Japan--US workshop on high-field superconducting materials and standard procedures for high-field superconducting materials testing.
K. Tachikawa, K. Yamafuji, H. Wada, J. W. Ekin, and M. Suenaga. 1989, 118p.
Contract AI01-84ER52113
Japan-US workshop on high field superconducting materials and standard procedures for high-field superconducting materials testing (6th), Boulder, CO (United States), 22-24 Feb 1989. Sponsored by Department of Energy, Washington, DC.

Keywords: *High-Tc Superconductors, *Superconducting Devices, *Superconductors, *Meetings, Proceedings, Foreign technology, EDB/665412, EDB/700430, Niobium aluminides, Niobium stannides.

High critical current densities and high magnetic fields are needed for most important energy applications of both conventional and high-Tc superconductors. This workshop brought together those engaged in research on high-field superconductors in Japan and the US to present recent research results on the performance of new high-field superconducting materials and to discuss the most promising directions for research, specifically as it relates to the fusion energy needs of both countries. Topics covered included critical currents, irradiation effects, ac losses, magnetization properties, and new fabrication processes for conventional superconductors. An entire session was devoted to presentations on the properties of Nb(sub 3)Al superconductors. Large magnet research programs for energy applications were reviewed, including the tokamak fusion machine at JAERI, the joint US-Japan Nb(sub 3)Sn poloidal-field-coil development program, and the proposed International Thermonuclear Experimental Reactor (ITER) project. Results were also presented on the VAMAS round robin in three areas; J(sub c), stress effects, and ac losses. Finally, some current research results on experimental high-(Tc) superconductors were reviewed, with particular emphasis on new fabrication processes and the factors limiting the critical current in high-current conductors. Separate abstracts have been prepared.

00,641
N94-10188/8 (Order as N94-10171/4, PC A20/MF A04)
National Inst. of Standards and Technology, Gaithersburg, MD.
Pulsatile Instability in Rapid Directional Solidification: Strongly-Nonlinear Analysis.
R. J. Braun, G. J. Merchant, K. Brattkus, and S. H. Davis. cAug 92, 4p.
In Esa, Proceedings of the 8TH European Symposium on Materials and Fluid Sciences in Microgravity, Volume 2 p 559-562. Sponsored by NASA, Washington.

Keywords: *Directional solidification (Crystals), *Flow stability, Microstructure, Oscillations, Mathematical models, Morphology, Nonlinearity, Temperature distribution.

In models of rapid directional solidification, non-equilibrium interfacial conditions are employed. As a result, there is an oscillatory mode of instability, as well as the steady cellular mode, found in the equilibrium model of Mullins and Sekerka. When the temperature field is decoupled from the problem, the preferred wave number for the oscillatory mode is zero, and the interface pulsates in time while remaining spatially uniform. Results from multiple scale analyses in the two limiting cases of the parameters are reported. In these limits, it is found that the instability is a bifurcation to relaxation oscillations; these nonlinear oscillations may be related to the observed microstructure that results from rapid solidification processes such as laser surface remelting.

00,642
PB93-124790 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
Fast Fourier Transforms for Space Groups Containing Rotation Axes of Order Three and Higher.
Final rept.
M. An, C. Lu, E. Prince, and R. Tolimieri. 1992, 4p.
Sponsored by Defense Advanced Research Projects Agency, Arlington, VA.
Pub. in Acta Cryst. A48, p346-349 1992.

Keywords: *Fast Fourier transforms, *Space groups, Crystal symmetry, Computation, Reprints.

Methods are described for exploiting the symmetry of uniaxial space groups containing rotation axes of order three and higher to improve the efficiency of computation of Fourier transforms. Mapping a symmetrical two-dimensional section into four dimensions enables the selection of non-contiguous asymmetric units over which fast Fourier transforms can be performed that reduce the computation time by a factor of approximately the order of the rotation axis. The application of the procedure to plane group p3 and its extension to p4 and p6 are described.

00,643
PB93-125839 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
Magnetic Transitions in the System YBa2Cu2.8Co0.2O6+y.
Final rept.
P. F. Miceli, J. M. Tarascon, P. Barboux, G. W. Hull, M. Giroud, J. J. Rhyne, D. A. Neumann, L. H. Greene, and B. G. Bagley. 1989, 4p.
Pub. in Physical Review B 39, n16 p12375-12378, 1 Jun 89.

Keywords: *High temperature superconductors, Cobalt additions, Nickel additions, Aluminum additions, Neutron scattering, Antiferromagnetism, Reprints, *Yttrium barium cuprates, Magnetic ordering.

We have studied the oxygen dependence of the two magnetic transitions (antiferromagnetic ordering of chains and planes) in YBa2Cu(2.8)Co(0.2)O(6+y) using neutron scattering. It is found that both transition temperatures increase with decreasing oxygen concentration. At y approx 0.37 =y(0) the two transition temperatures are equal, so that chains and planes order at a single transition temperature for y =or< y(0). For y=1 the compound is superconducting at 60K. Therefore, this system qualitatively exhibits the magnetic and superconducting properties of pure YBa2Cu3O(6+y) while providing an important insight on the oxygen dependence of chain site magnetic ordering. A discussion is presented which also includes results on Ni and Al substitutions.

00,644
PB93-125847 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
Charge Transfer and Bond Lengths in YBa2Cu3-xMxO6+y.
Final rept.
P. F. Miceli, J. M. Tarascon, L. H. Greene, J. J. Rhyne, D. A. Neumann, P. Barboux, and J. D. Jorgensen. 1989, 7p.
See also DE90002241.
Pub. in Materials Research Society Symposium Proceedings High Temperature Supercond.: Relat. Prop., Struct., Solid-State Chem., v156 p119-125 1989.

Keywords: *High temperature superconductors, Crystal doping, Charge transfer, Chemical bonds, Neutron scattering, Reprints, *Yttrium barium cuprates.

We discuss the effects of doping on the Cu chain sites in YBa2Cu(3-x)M(x)O(6+y). The relationship between bond lengths obtained from neutron scattering and charge transfer is evaluated in terms of bond valence. In particular, it is concluded that removing an oxygen from the chains transfers one electron to the planes.

00,645
PB93-125862 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Inorganic Analytical Research Div.
Improvements to the Chebyshev Expansion of Attenuation Correction Factors for Cylindrical Samples.
Final rept.
D. F. R. Mildner, and J. M. Carpenter. 1990, 9p.
Pub. in Jnl. of Applied Crystallography 23, p378-386 Oct 90.

Keywords: Neutron diffraction, Cylindrical configuration, Sum rules, Accuracy, Reprints, *Attenuation correction factors, Chebyshev expansion method.

The accuracy of the Chebyshev expansion coefficients used for the calculation of attenuation correction factors for cylindrical samples has been improved. An increased order of expansion allows the method to be useful over a greater range of attenuation. We show that many of these coefficients are exactly zero, others are rational numbers, and others are rational fractions. We also examine the assumptions of Sears in his asymptotic expression of the attenuation correction factor.

00,646
PB93-139012 PC A03/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Applied and Computational Mathematics Div.
Thermodynamically-Consistent Phase-Field Models for Solidification.
S. L. Wang, R. F. Sekerka, A. A. Wheeler, R. J. Brown, G. B. McFadden, B. T. Murray, and S. R. Coriell. Nov 92, 26p, NISTIR-4956.
Prepared in cooperation with Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Physics, and Bristol Univ. (England). School of Mathematics.

Keywords: *Crystal growth, *Solidification, Liquid-solid interfaces, Phase transformations, Mathematical models, Crystallization, Thermodynamics, Entropy, Alloys, Free boundary problems, Phase field models.

In an effort to unify the various phase-field models that have been used to study solidification, we have developed a class of phase-field models for crystallization of a pure substance from its melt. These models are based on an entropy functional, as in the treatment of Penrose and Fife, and are therefore thermodynamically consistent inasmuch as they guarantee spatially local positive entropy production. General conditions are developed to ensure that the phase field takes on definite values, independent of temperature, for the bulk phases. Specific forms of a phase-field function are chosen to produce two models that bear strong resemblances to the models proposed by Langer and Kobayashi. Our models contain additional nonlinear functions of the phase field that are necessary to guarantee thermodynamic consistency.

00,647
PB93-139061 PC A03/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Applied and Computational Mathematics Div.
Asymptotic Behavior of Modulated Taylor-Couette Flows with a Crystalline Inner Cylinder.
R. J. Braun, G. B. McFadden, B. T. Murray, M. E. Selleck, S. R. Coriell, and M. E. Glicksman. Nov 92, 47p, NISTIR-4971.
Prepared in cooperation with Rensselaer Polytechnic Inst., Troy, NY. Dept. of Materials Engineering.

Keywords: *Crystal growth, *Solidification, Coaxial configuration, Prandtl number, Asymptotic series, Hydrodynamics, Cylinders, Instability, Crystal-melt interface, Taylor-Couette flow, Floquet theory, Succinonitrile.

The authors consider the linear stability of a modulated Taylor-Couette system when the inner cylindrical boundary consists of a crystalline solid-liquid interface. Both experimentally and in numerical calculations it is found that the two-phase system is significantly less stable than the analogous rigid-walled system for materials with moderately large Prandtl numbers. A numerical treatment based on Floquet theory is described, which gives results that are in good agreement with preliminary experimental findings. In addition, the instability is further examined by carrying out a formal asymptotic expansion of the solution in the limit of large Prandtl number. In the limit the Floquet analysis is considerably simplified, and the linear stability of the modulated system can be determined to leading order through a conventional stability analysis, without recourse to Floquet theory. The resulting simplified problem is then studied for both the narrow gap geometry and for the case of a finite gap. It is surprising that the determination of the linear stability of a two-phase system is considerably simpler than that of the rigid-walled system, despite the complications introduced by the presence of the crystal-melt interface.

00,648
PB93-141737 PC A11/MF A03
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD.
Accuracy in Powder Diffraction II. Proceedings of the International Conference. Held in Gaithersburg, Maryland on May 26-29, 1992.
Special pub. (Final).
E. Prince, and J. K. Stalick. Oct 92, 244p, NIST/SP-846.
Also available from Supt. of Docs. as SN003-003-03186-1. See also PB80-200488. Sponsored by International Union of Crystallography, and JCPDS-International Centre for Diffraction Data, Swarthmore, PA.

Keywords: *Crystal structure, *Lattice parameters, *Meetings, X-ray diffraction, Neutron diffraction, Phase studies, Computer applications, Microstructure, International, Instruments, Automation, Standards, Accuracy.

The proceedings of the International conference Accuracy in Powder Diffraction II present the invited papers and abstracts of the papers contributed to the conference, which was held at NIST, Gaithersburg, Maryland, during May 26-29, 1992. The conference was organized by the Commission on Powder Diffraction of the International Union of Crystallography, and was jointly sponsored by NIST, JCPDS--International Centre for Diffraction Data and the International Union of Crystallography. The proceedings contain 25 invited papers and 73 contributed abstracts. The program of the conference was divided into six topics: Phase Identification and Quantification; Accuracy and Standards; New Developments in Software and Data Analysis; Profile Fitting, Decomposition and Microstructural Effects; Novel Applications and Structural Science; and New Developments in Hardware, Including Detectors, and Studies under Non-ambient and Time-resolved Conditions. A ceremonial session was devoted to a tribute to the late William Parrish and his contributions to powder diffraction. In addition, there were two tutorial workshops organized by the JCPDS--International Centre for Diffraction Data, one on diffractometer sensitivity and one on automatic indexing methods.

00,649
PB93-150712 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Quantized Dissipation of the Quantum Hall Effect at High Currents.
Final rept.
M. E. Cage. 1992, 2p.
See also PB90-241365.
Pub. in Conference Record for Conference on Precision Electromagnetic Measurements (CPEM'92), Paris, France, June 9-12, 1992, p362-363.

Keywords: *Hall effect, Electron transitions, Electron gas, Two dimensional, Dissipation, Reprints, *Quantum Hall effect, Landau levels.

Quantized dissipative voltage states are observed when large currents are passed through high-quality quantized Hall resistance devices. These dissipative states are interpreted as occurring when electrons make transitions between Landau levels and then return back to the lowest-filled levels.

00,650
PB93-150845 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Surface and Microanalysis Science Div.
SIMS Determination of Oxygen and Carbon in YBa2Cu3O7-x Superconductors.
Final rept.
G. Gillen, P. Chi, and D. S. Simons. 1990, 4p.
Pub. in Proceedings of Ion Mass Spectroscopy (2nd), SIMS 7, p697-700 1990.

Keywords: *Superconducting films, *YBCO superconductors, *Carbon, *Oxygen, Ion implantation, Concentration(Composition), Thin films, Reprints, *Yttrium barium cuprates, Secondary ion mass spectroscopy, Sputtered films.

Using minor isotope in-situ ion implantation of (18)O and (13)C, secondary ion mass spectrometry was used to quantify the levels of oxygen and carbon in a magnetron-sputtered thin film superconductor. Systematic errors in our analysis and implantation techniques were evaluated by checking against independent (12)C and (18)O implants in silicon. In both cases, the doses determined by the in-situ implant technique were within 6% of the nominal values. Secondary ion imaging of the superconducting thin film indicated that carbon was localized primarily in the grain boundaries. It was also found that the measured carbon concentration varied as a function of depth. Determination of oxygen levels in the material gave a calculated oxygen concentration of 56.4 atomic %, comparing well with the expected value of 54 atomic %. For both of these analyses, precision and accuracy were limited by the roughness of the superconducting film which made it difficult to obtain accurate crater depth measurements.

00,651
PB93-151199 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Semiconductor Electronics Div.
Charge Trapping in Cubic Silicon Carbide MIS Capacitors.
Final rept.
J. J. Kopanski, and R. E. Avila. 1992, 6p.
Contracts NASA-C-30007-K, NASA-C-30018-M
Sponsored by National Aeronautics and Space Administration, Cleveland, OH. Lewis Research Center.
Pub. in Springer Proceedings in Physics - Amorphous and Crystalline Silicon Carbide III, v56 p119-124 1992.

Keywords: *Trapping(Charged particles), Temperature dependence, Silicon carbides, Cubic lattices, Interfaces, Electron traps, Hole traps, Capacitors, Instability, Reprints, MIS(Semiconductors), Fowler-Nordheim tunneling.

The charge trapping properties of the insulator and the insulator-SiC interface of cubic SiC metal-insulator-semiconductor (MIS) capacitors have been studied. The interface trap level density, D(it), was determined by the high-frequency capacitance-voltage and the conductance-voltage techniques. The number of active interface traps increases sharply in the range from room temperature to 260 C. SiC MIS capacitors exhibit a slow-trapping instability when subjected to a stress voltage. Both the bulk oxide trap density, N(ot), and the D(it) are seen to increase during a voltage stress. The conduction mechanism in thermal oxide layers on SiC is limited by Fowler-Nordheim emission with a barrier height of about 2.9 eV.

00,652
PB93-151256 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
Polarization Analysis of the Magnetic Excitations in Invar Fe86B14.
Final rept.
J. W. Lynn, N. Rosov, Q. Lin, C. H. Lee, and G. Fish. 1992, 3p.
Sponsored by National Science Foundation, Washington, DC.
Pub. in Physica B 180-181 p253-255 1992.

Keywords: *Invar, Boron containing alloys, Iron alloys, Neutron scattering, Polarized beams, Amorphous materials, Spin waves, Monochromators, Magnetization, Reprints, Magnetic excitations.

Triple-axis polarized inelastic neutron scattering experiments have been carried out on the amorphous ferromagnet Fe(86)B(14) to separate the longitudinal fluctuations from the transverse (spin wave) excitations. The data suggest that longitudinal excitations exist not only in the vicinity of T(c), but substantially below the ordering temperature as well. The existence of these 'hidden' excitations may well explain the 'Invar anomaly'.

00,653
PB93-151645 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Gas and Particulate Science Div.
MeV Be Implantation in GaAs.
Final rept.
M. V. Rao, P. E. Thompson, H. B. Dietrich, and D. S. Simons. 1990, 236p.
Pub. in Jnl. of Applied Physics 67, n10 p6165-6170 1990.

Keywords: *Gallium arsenides, *Ion implantation, *Beryllium ions, MeV range 1-10, Hall effect, Activation, Annealing, Wafers, Reprints, Secondary ion mass spectroscopy, Rapid thermal annealing.

High-energy Be implantation was performed at 1, 2, and 3 MeV for a dose of 1 x 10(sup 13)/sq cm and at 2 MeV in the dose range of 4 x 10(sup 12) to 1 x 10(sup 14)/sq cm. Range statics from as-implanted secondary ion mass spectrometry profiles were calculated. The implanted wafers were activated by either furnace or rapid thermal anneal. For the same implant dose, 1 x 10(sup 13)/sq cm, the dopant electrical activation decreased with increasing ion energy. For the 2 MeV implants, the dopant electrical activation increased with the implant dose, in the range used in this study. An activation as high as 98% was measured for the 2 MeV/10(sup 14)/sq cm Be-implant.

00,654
PB93-151694 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
NIST Cold Neutron Research Facility and Magnetic Neutron Scattering.
Final rept.
J. J. Rhyne, and C. F. Majkrzak. 1990, 6p.
See also PB93-135440.

Pub. In Jnl. of Applied Physics 67, n9 p5693-5698 1990.

Keywords: *Research facilities, *Cold neutrons, Time-of-flight method, Small angle scattering, Inelastic scattering, Neutron scattering, Amorphous materials, Neutron detectors, Magnetization, Diffraction, Reprints, Reflectometry.

The National Institute of Standards and Technology has under development a major Cold Neutron Research Facility which on completion will make available approximately 15 new neutron scattering instruments located on neutron guides on the reactor cold source. This facility, which includes the NSF Center for High Resolution Neutron Scattering, will be operated as a user facility, which is open via a proposal system to all scientists. This paper briefly reviews the types of cold neutron instruments that have particular relevance to magnetic problems. A discussion is given of neutron scattering from magnetic systems with examples of problems appropriate for the enhanced energy and wave vector resolution of cold source instruments. Included is a review of new experimental results and techniques that will be available, including reflectometry and grazing-angle diffraction, as well as more conventional techniques such as triple axis inelastic scattering, small angle scattering, and time-of-flight spectroscopy.

00,655
PB93-151702 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Technology Div.
Tunneling Stabilized Magnetic Force Microscopy of YBa2Cu3O7-Delta Films on MgO at 76 K.
Final rept.
P. Rice, and J. Moreland. 1991, 3p.
See also PB91-203653 and PB92-144948.
Pub. in IEEE (Institute of Electrical and Electronics Engineers) Transactions on Magnetics 27, n6 p5181-5183 Nov 91.

Keywords: *Superconducting films, *YBCO superconductors, Temperature range 0065-0273 K, High temperature superconductors, Scanning tunneling microscopy, Type 2 superconductors, Magnetic films, Magnesium oxides, Substrates, Reprints, *Yttrium barium cuprates, Magnetic force microscopy, Sputtered films.

Tunneling Stabilized Magnetic force microscopy (TSMFM) is an elementary variation of scanning tunneling microscopy (STM). As in STM, a sharp conductive tip is scanned across a conductive sample with an electrical potential applied. As the tip is scanned, changes in tunneling current are plotted on a computer screen as a topographical image. The difference between STM and TSMFM is that the TSMFM tip is made from a flexible magnetic film which deflects in response to sample surface magnetic forces. Pinning of the Abrikosov flux lattice in high temperature superconductors determines the critical current. We have applied TSMFM to these high temperature superconductors. We present images of sputter deposited YBa2Cu3O(7-delta) films below the critical temperature.

00,656
PB93-151710 Not available NTIS
National Inst. of Standards and Technology (CSTL), Gaithersburg, MD. Surface and Microanalysis Science Div.
Mechanistic Studies of Photoinduced Reactions at Semiconductor Surfaces.
Final rept.
L. J. Richter, and R. R. Cavanagh. 1992, 72p.
Pub. in Progress in Surface Science 39, p155-226 1992.

Keywords: *Surface reactions, *Semiconductors, *Gallium arsenides, *Silicon, *Interfaces, Desorption, Oxidation, Etching, Substrates, Reviews, Reprints, Photoinduced reactions.

Photoinduced reactions at semiconductor surfaces and interfaces have recently come under intense study. This activity is motivated both by the potential technological importance of photoinduced device processing and by the fascinating complexity of the underlying science. The basic mechanisms by which photons can drive surface/interface reactions can be categorized into direct excitation of an ambient species, direct excitation of an adsorbed species, or indirect excitation via absorption within the substrate. We summarize the essential aspects of these basic mechanisms and then review recent studies that have focused on identifying the basic photoexcitation mechanism. The review encompasses studies of molecular desorption from, metal deposition on, and the oxidation and etching of Si and GaAs substrates.

00,657
PB93-151728 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
Resolution Considerations for Polarized Triple-Axis Spectrometry.
Final rept.
N. Rosov, J. W. Lynn, and R. W. Erwin. 1992, 2p.
Pub. in Physica B 180-181, p1003-1004 1992.

Keywords: Spin orientation, Magnetization, Reflectivity, Analyzers, Resolution, Reprints, *Polarized beam spectroscopy, Neutron polarization.

It is well known that the cross-sections for triple-axis polarized beam spectroscopy depend on the relative orientation of the neutron polarization P and the momentum transfer Q. This orientational dependence of the cross-sections can give rise to large resolution effects when the direction of Q varies substantially over the resolution function, which is often the case with polarized beam measurements because relaxed resolution is frequently employed to compensate for reduced intensities. This is also true when measurements are made at small wave vectors, as is necessary for amorphous materials. We find that the positions of excitations can be shifted significantly, and the intensities can deviate by a factor of two or more from the ideal case.

00,658
PB93-151850 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Re-Examination of Quantum Hall Plateaus.
Final rept.
C. T. Van Degrift, K. Yoshihiro, E. C. Palm, M. E. Cage, J. Wakabayashi, and S. Kawaji. 1992, 2p.
Pub. in Proceedings of Conference on Precision Electromagnetic Measurements (CPEM'92), Paris, France, June 9-12, 1992, p288-289.

Keywords: *Electrical resistance, Electrical measurement, Magnetic fields, Precision, Silicon, MOSFET, Reprints, *Quantum Hall effect, Resistance standards.

Even though the practical unit of electrical resistance was tied to the quantum Hall effect in 1990, our understanding of the fundamental physics of current flow, contacting, and impurity effects in quantum Hall systems remains incomplete. This paper examines some recently discovered effects which may affect quantum Hall resistance determinations.

00,659
PB93-151876 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Reaction Sintering High-Density, Fine-Grained Ba2YCu3O6.5+x Superconductors Using Ba(OH) 2.H2O.
Final rept.
J. S. Wallace, B. A. Bender, S. H. Lawrence, and D. J. Schrodt. 1988, 9p.
Pub. in Ceramics Supercond. 2, p243-251 1988.

Keywords: *YBCO superconductors, *Sintering, High temperature superconductors, Barium hydroxides, Reprints.

A technique for sintering high density, fine-grained BYCO superconductors employing Ba(OH)2.H2O using a single step reaction sintering cycle and partial vacuum has been developed. The materials produced are nearly single-phase and have cleaner grain boundaries than many BYC materials produced using BaCO3 and multiple step calcining/grinding procedures.

00,660
PB93-151942 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Structural Phase Transition Studies of High Tc Superconducting Materials.
Final rept.
W. Wong-Ng, L. P. Cook, C. K. Chiang, L. J. Swartzendruber, and L. H. Bennett. 1988, 16p.
Pub. in Ceramic Superconductors II, p27-42 1988.

Keywords: *High temperature superconductors, *Crystal-phase transformations, Orthorhombic lattices, Tetragonal lattices, Transition temperature, Samarium oxides, Gadolinium oxides, Erbium oxides, Rare earth compounds, Reprints, Yttrium barium cuprates.

In order to gain more insight into the effect of oxygen stoichiometry on superconductivity, and the correlation between the size of the rare-earth elements and superconductivity, the phase transitions between the orthorhombic and tetragonal structures of several high Tc superconductors Ba2RCu3O(6+x) (where R= Sm, Y, Gd and Er; X=0 to 1) have been investigated. All samples were prepared from orthorhombic starting materials by annealing at temperatures from 400 to 1000 C in air, followed by rapid quenching. Quenching was performed by using a liquid nitrogen-cooled copper cold well with a continuous flow of cooled helium gas. Various measurements including x-ray diffraction, thermogravimetric analysis, and Meissner effects were carried out in order to correlate the nature of the phase transition with crystallographic data, superconductivity and annealing temperature.

00,661
PB93-152072 PC A06/MF A02
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Materials Reliability Div.
Modeling of X-ray Diffraction Line Broadening with the Voigt Function: Applications to High-T(sub c) Superconductors.
Doctoral thesis.
D. Balzar. Jan 93, 101p, NISTIR-3998.
See also PB92-165034.

Keywords: *High temperature superconductors, *X-ray diffraction, *Superconductors, Line broadening, Crystal defects, Theses, Lanthanum barium cuprates, Lanthanum calcium cuprates, Lanthanum strontium cuprates, Lanthanum cuprates, Bismuth strontium calcium cuprates, Voight functions.

A method to analyze powder-diffraction line broadening is proposed and applied to some novel high-T(sub c) superconductors. Assuming that both size-broadened and strain-broadened profiles of the pure-specimen profile are described with a Voigt function, it is shown that the analysis of Fourier coefficients leads to the Warren-Averbach method of separation of size and strain contributions. The method was applied to two cubic structures with average volume-weighted domain sizes up to 3600 A, as well as to tetragonal and orthorhombic (La-Sr)2CuO4, which exhibit weak line broadenings and highly overlapping reflections. Comparison with the Integral-breadth methods is given. Reliability of the method is discussed in the case of a cluster of the overlapping peaks. The analysis of La2CuO4 and La(1.85)M(0.15)CuO4 (M = Ca, Ba, Sr) high-T(sub c) superconductors showed that microstrains and incoherently diffracting domain sizes are highly anisotropic. In the superconductors, stacking-fault probability increases with increasing T(sub c); microstrain decreases. In La2CuO4, different broadening of (h00) and (0k0) reflections is not caused by stacking faults; it might arise from lower crystallographic symmetry.

00,662
PB93-153237 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Magnetic Field Dependence of Quantized Hall Effect Breakdown Voltages.
Final rept.
M. E. Cage. 1992, 4p.
Sponsored by Department of Defense, Washington, DC.
Pub. In Semiconductors Science and Technology 7, p1119-1122 1992.

Keywords: Magnetic fields, Electron gas, Two dimensional, Quantization, Voltage, Reprints, *Quantum Hall effect.

When large currents are passed through a high-quality quantized Hall resistance device, the voltage drop along the device is observed to assume discrete, quantized states when plotted against the magnetic field. These quantized voltage states are interpreted as occurring when electrons are excited to higher Landau levels and then return to the original Landau level. The quantization is found to be a function of magnetic field, and consequently can be more difficult to verify and determine than previously suspected.

00,663
PB93-153328 Not available NTIS

National Inst. of Standards and Technology (MSEL), Boulder, CO. Materials Reliability Div.
Orientation Dependence of Flux Pinning in a Layered Bi2Sr2Ca1Cu2O8 + 10% Ag Composite.
Final rept.
M. Foldeaki, and H. Ledbetter. 1992, 6p.
Pub. in Materials Research Society Symposium Proceedings, v235 p701-706 1992.

Keywords: *Superconductors, *Flux pinning, Superconducting composites, Magnetic anisotropy, Magnetic hysteresis, Magnetic susceptibility, Meissner effect, Polycrystalline, High temperature superconductors, Orientation, Silver, Reprints, *Bismuth strontium calcium cuprates.

The Bi2Sr2Ca1Cu2O8 + 10% Ag specimen was grain oriented along the a(b) axis, but random in the perpendicular plane. Magnetic susceptibility and hysteresis measured along the axis of grain orientation and in the polycrystalline direction showed remarkable anisotropy. At low temperatures (below about 30 K), hysteresis curves were compatible with the strong-pinning model. The pinning force calculated from the hysteresis loop showed a higher maximum in the random direction, but decreased fast with increasing field and temperature. From the zero-field-cooled (zfc) and field-cooled (fc) susceptibility curves, the irreversibility line was determined. Evaluation according to the de Almeida-Thouless equation with fixed exponent n=3/2 revealed a two-phase vortex structure; one nearly isotropic with low (40-K) zero-field irreversibility transition temperature, and one strongly anisotropic, the irreversibility transition being close to the superconducting-transition temperature.

00,664
PB93-153344 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Technology Div.
Demagnetizing Factors.
Final rept.
R. B. Goldfarb. 1992, 2p.
See also PB92-165174.
Pub. in Concise Encyclopedia of Magnetic and Superconducting Materials, p103-104 1992.

Keywords: *Demagnetization, Circular cylinders, Ellipsoids, Diamagnetism, Ferromagnetism, Paramagnetism, Magnetostatics, Magnetic fields, Superconductivity, Reprints.

Demagnetizing factors for ellipsoids of revolution and right circular cylinders are reviewed.

00,665
PB93-153351 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Technology Div.
Magnetic Units and Materials Specification.
Final rept.
R. B. Goldfarb. 1992, 6p.
Pub. in Concise Encyclopedia of Magnetic and Superconducting Materials, p253-258 1992.

Keywords: *Magnetism, Units of measurement, Magnetic susceptibility, Magnetic permeability, Magnetic hysteresis, Magnetic materials, Symbols, Reprints, Conversion factors.

The paper is an encyclopedia article on magnetic units and material specification.

00,666
PB93-153369 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Technology Div.
Comparison of Transport Critical Current Measurement Methods.
Final rept.
L. F. Goodrich, and A. N. Srivastava. 1992, 8p.
Pub. in Advances in Cryogenic Engineering (Materials), v38 p559-566 1992.

Keywords: *Superconductors, *Critical current, Electrical measurement, Comparative evaluations, Reprints.

The critical current (I(c)) of a superconductor can be measured using a variety of measurement systems and techniques. The measurement system should be chosen based upon several considerations including accuracy, the number of samples to be measured, and measurement environment. The system may vary in complexity from a simple analog recorder that monitors the voltage-current characteristic, to a sophisticated computerized data acquisition system that monitors several different experimental parameters. Various measurement techniques are available for measuring I(c), including the dc, pulse, and ac methods. Each technique, along with its advantages and disadvantages, is discussed.

00,667
PB93-153377 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Effect of Composition on Superconducting Properties in the System Ba-Y-Gd-Cu-O.
Final rept.
M. D. Hill, W. Wong-Ng, C. K. Chiang, J. E. Blendell, E. Lagergren, R. Kacker, E. R. Fuller, and B. Paretzkin. 1992, 5p.
Pub. in Jnl. of the American Ceramics Society 75, n9 p2390-2394 1992.

Keywords: *Superconductors, High temperature superconductors, Solid solutions, Reprints, *Yttrium barium cuprates, *Gadolinium barium cuprates, Phase equilibrium.

The superconducting properties of a solid-solution region in the Ba-Y-Gd-Cu-O system were investigated as a function of composition. Phase relations, the peritectic decomposition temperature, the superconducting onset temperature T(c), and the transport current density J(c) were measured. The highest T(c) and J(c) are observed along the line between the stoichiometric Ba2YCu3O(6+x) and Ba2GdCu3O(6+x) compositions.

00,668
PB93-153401 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Electron and Optical Physics Div.
Correlations of Magnetic Microstructure and Anisotropy with Noise Spectra for CoNi and CoCrTa Thin Film Media.
Final rept.
M. R. Khan, S. Y. Lee, J. L. Pressesky, R. D. Fisher, N. Heiman, M. R. Scheinfein, J. Unguris, D. T. Pierce, R. J. Celotta, D. E. Speliotis, D. Williams, and S. L. Duan. 1990, 3p.
Pub. in IEEE (Institute of Electrical and Electronics Engineers) Transactions on Magnetics 26, n5 p2715-2717 Sep 90.

Keywords: *Cobalt alloys, Magnetic alloys, Magnetic anisotropy, Magnetic domains, Magnetic films, Magnetic hysteresis, Chromium containing alloys, Nickel containing alloys, Thin films, Microstructure, Correlation, Noise, Reprints.

The paper reports on two thin film media alloys Co(86)Cr(12)Ta(2) and Co(75)Ni(25) which have very different noise characteristics. The magnetic microstructure of these films was observed with SEMPA. The anisotropy and the rotational hysteresis loss measurements have been made using a torque magnetometer. The distribution of anisotropy field Hk and its width dHk have also been measured, along with its different normalized values. We suggest that the observed magnetic microstructure can be directly correlated with measured readback noise and anisotropy differences.

00,669
PB93-153468 Not available NTIS
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Semiconductor Electronics Div.
Analysis of Persistent Photoconductivity Due to Potential Barriers.
Final rept.
J. R. Lowney, and S. Mayo. 1992, 6p.
See also PB92-171404.
Pub. in Jnl. of Electronic Materials 21, n7 p731-736 1992.

Keywords: *Photoconductivity, Silicon oxides, Electron traps, Hole traps, Interfaces, Reprints, Carrier recombination, Silicon resistors, SIMOX.

Persistent photoconductivity has been seen in thin silicon resistors fabricated with SIMOX material at temperatures between 60 and 220 K. This effect has been attributed to the depletion of carriers near the interface between the top silicon layer and the buried oxide, which is due to the large number of surface traps at this interface. The depletion of carriers is accompanied by a built-in field on the order of 10,000 V/cm, which causes a potential barrier that is nearly a quarter of the energy gap of silicon. The theory of the recombination kinetics of majority carriers with minority carriers trapped at the interface on the other side of a potential barrier is studied. Both the possibilities of tunneling and thermal activation have been considered. The results show that thermal activation dominates at the temperatures of our measurements in SIMOX material, while at lower temperatures tunneling would dominate.

00,670
PB93-153518 Not available NTIS
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Technology Div.
Dynamic Resistance of Superconducting YBa2Cu3Ox Sintered Powder at 81 K: Liquid versus Vapor Nitrogen Environment.
Final rept.
J. Moreland, W. P. Dube, and L. F. Goodrich. 1992, 8p.
Pub. in Advances in Cryogenic Engineering (Materials), v38 p965-972 1992.

Keywords: *Superconductors, High temperature superconductors, Liquid nitrogen, Environmental tests, Flowmeters, Bolometers, Electrical resistance, Superconducting devices, Reprints, *Yttrium barium cuprates.

The dynamic resistance as a function of transport current in a superconducting YBa2Cu3Ox (YBCO) sintered powder sample depends on its thermal surroundings. Plots of V, dV/dI, and the second derivative of V with respect to I versus I are markedly different for the sample in vapor nitrogen compared to those measured in liquid nitrogen at 81 K. Plots of (I x the second derivative of V with respect to I)/dV/dI as a function of I and dV/dI quantify the curvature of the V-I characteristics of the sample. At 81 K, we find that at the onset of detectable flux flow in the sample, the n factor determined from the dynamic derivatives of the V-I curve is 15 in the vapor versus 5 in the liquid. This phenomena could be the basis for low power cryogenic flow meters, bolometers, level detectors, or other types of thermal environment sensors.

00,671
PB93-156743 PC A03/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD.
Computation of Complex Solidification Morphologies Using a Phase-Field Model.
B. T. Murray, A. A. Wheeler, W. J. Boettinger, and G. B. McFadden. Feb 93, 23p, NISTIR-5124.
Prepared in cooperation with Bristol Univ. (England). School of Mathematics.

Keywords: *Dendritic crystals, *Crystal growth, *Solidification, Finite difference theory, Two dimensional, Mathematical models, Anisotropy, Dendrites, Computation, Phase field models.

An anisotropic phase-field model is used to calculate numerically the solidification patterns of a pure material into an undercooled liquid in a two-dimensional rectangular region. In the phase-field approach, the solid-liquid interface is treated as diffuse, and a dynamic equation for the phase variable is introduced in addition to the equation for heat flow. The phase-field model equations are solved using finite-difference techniques on a uniform mesh. Calculations for dendritic growth are presented for both four-fold and six-fold anisotropy, and the effect of the level of anisotropy on the growth of a dendrite is investigated. A previous study has shown that performing computations with an interface that is sufficiently thin for the numerical solution to accurately represent a sharp interface model is computationally demanding. However, even with a relatively thick interface, the computations using the phase-field model show many of the qualitative features of dendritic growth, and the method is well suited for handling the evolution of very complex, realistic interface shapes.

00,672
PB93-164564 PC A03/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Applied and Computational Mathematics Div.
Phase-Field Models for Anisotropic Interfaces.
G. B. McFadden, A. A. Wheeler, R. J. Braun, S. R. Coriell, and R. F. Sekerka. Feb 93, 28p, NISTIR-5130.
Prepared in cooperation with Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Physics.

Keywords: *Solidification, Mathematical models, Asymptotic series, Two dimensional, Free energy, Anisotropy, Interfaces, Phase free models.

The inclusion of anisotropic surface free energy and anisotropic linear interface kinetics in phase-field models is studied for the solidification of a pure material. The formulation is described for a two-dimensional system with a smooth crystal-melt interface and for a surface free energy that varies smoothly with orientation, in which case a quite general dependence of the surface free energy and kinetic coefficient on orientation can be treated; it is assumed that the anisotropy is mild enough that missing orientations do not occur. The method of matched asymptotic expansions is used to recover the appropriate anisotropic form of the Gibbs-Thomson equation in the sharp-interface limit in which the width of the diffuse interface is thin compared to its local radius of curvature. It is found that the surface free energy and the thickness of the diffuse interface have the same anisotropy, whereas the kinetic coefficient has an anisotropy characterized by the product of the interface thickness with the intrinsic mobility of the phase field.

00,673
PB93-165728 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Electron and Optical Physics Div.
Surface Magnetic Microstructure.
Final rept.
M. R. Scheinfein, J. Unguris, R. J. Celotta, and D. T. Pierce. 1990, 9p.
See also PB90-188210.
Pub. in Magnetic Properties of Low-Dimensional Systems II, Springer Proceedings in Physics, v50 p2-10 1990.

Keywords: Scanning electron microscopy, Ferromagnetic materials, High resolution, Bloch wall, Domain walls, Magnetization, Microstructure, Reprints, *Surface magnetism, Electron spin polarization, Micromagnetics, Neel walls.

The way in which a magnetic solid minimizes its energy through the formation of domain walls is strongly influenced by the presence of the surface. At the surface, a bulk Bloch wall may change into Neel wall in order to reduce the magnetic stray field energy of the ferromagnetic system. The authors present high spatial resolution images of surface magnetic microstructure obtained by scanning electron microscopy with polarization analysis (SEMPA). Quantitative domain wall profiles at surfaces have been measured for a wide variety of ferromagnetic materials which display asymmetric surface Neel walls for bulk-like thicknesses. The authors have calculated the magnetic moment configuration at the surface, using bulk magnetic parameters and an iterative micromagnetic energy minimization scheme. The calculated profiles are compared directly with experimental surface magnetization profiles. The surface magnetic microstructure of a surface magnetic topological singularity is observed and an upper limit on the size of the singularity is determined.

00,674
PB93-165736 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Electron and Optical Physics Div.
High Spatial Resolution Quantitative Micromagnetics.
Final rept.
M. R. Scheinfein, J. Unguris, D. T. Pierce, and R. J. Celotta. 1990, 6p.
Pub. in Jnl. of Applied Physics 67, n9 p5932-5937 1990.

Keywords: Scanning electron microscopy, Ferromagnetic materials, High resolution, Imaging techniques, Domain walls, Bloch wall, Magnetization, Reprints, *Surface magnetism, Magnetic force microscopy, Micromagnetics, Neel walls.

Magnetization distributions near surfaces are observed with scanning electron microscopy with polarization analysis (SEMPA). This technique allows for quantitative analysis of the vector magnetization distribution near surfaces with 50 nm spatial resolution. Magnetization distributions in surface Neel walls which terminate bulk 180 degree Bloch walls near surfaces have been calculated by solving the micromagnetic equations using energy minimization. Excellent quantitative agreement between measured and calculated surface wall profiles is found for several common ferromagnetic materials. The magnetization distributions resulting from the micromagnetic calculations are used to estimate the magnetic contrast that would be observed in transmission Lorentz microscopy, magnetic force microscopy (MFM) and in the Bitter technique for the observation of surface wall profiles. Comparisons between these magnetic imaging techniques is given with an emphasis on image interpretation and the ultimate spatial resolution achievable with each technique.

00,675
PB93-166098 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Metallurgy Div.
Iron Magnetic Moments in Iron/Silica Gel Nanocomposites.
Final rept.
R. D. Shull, J. J. Ritter, A. J. Shapiro, L. J. Swartzendruber, and L. H. Bennett. 1990, 3p.
Pub. in Jnl. of Applied Physics 67, n9 p4490-4492, 1 May 90.

Keywords: *Iron, *Magnetic moments, Electron microscopy, Spin glass, Mossbauer effect, X-ray diffraction, Magnetization, Silica gel, Reprints, Nanocomposites.

Homogeneous gelled composites of iron and silica containing 11-40 wt. % Fe have been prepared by low-temperature polymerization of aqueous solutions of ferric nitrate, tetraethoxysilane, and ethanol (with an HF catalyst). X-ray diffraction, electron microscopy, Mossbauer effect, and magnetization measurements have been used to show that these bulk materials are paramagnetic composites at room temperature and remain in that state to 10 K. In this condition the Fe is present in nanometer-sized regions and exists in ionic form (both Fe(3+) and Fe(2+)). It possesses a large magnetic moment which decreases linearly from 3.9 mu(sub B)/Fe atom to 2.8 mu(sub B)/Fe atom as the Fe content increased from 11% to 40%. For this composition increase, a negative Curie-Weiss temperature was found which increased in magnitude linearly from -13 to -46 K. It is suggested that many of the iron atoms in the as-cured nanocomposites interact antiferromagnetically, and that the magnitude of the effect increases with the Fe concentration. After treatment in hydrogen, the state of the Fe changes.

00,676
PB93-166130 Not available NTIS
National Inst. of Standards and Technology (IMSE), Gaithersburg, MD. Reactor Radiation Div.
Magnetic Phase Transitions and Structural Distortion in Nd2CuO4.
Final rept.
S. Skanthakumar, H. Zhang, J. W. Lynn, W. H. Li, and T. W. Clinton. 1989, 5p.
See also PB90-254921.
Pub. in Physica C 160, n2 p124-128 1989.

Keywords: *Superconductors, Phase transformations, X-ray diffraction, Neutron diffraction, Single crystals, Magnetic properties, Tetragonal lattices, Polarized beams, Antiferromagnetism, Reprints, *Neodymium cuprates, Magnetic ordering.

Neutron and x-ray diffraction have been used to study the magnetic and structural properties of single crystal Nd2CuO4. Long range magnetic order of the Cu moments develops at T(N) = 245 K, with a noncollinear antiferromagnetic arrangement of spins. Additional abrupt transitions are observed at 75 K and 30 K, in which a spin reorientation takes place. Bragg peaks associated with the crystal structure are found at the same positions as the magnetic Bragg peaks, and indicate that a distortion of the basic tetragonal structure has occurred above 300 K.

00,677
PB93-166171 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Surface Science Div.
Faceting Induced by an Ultrathin Metal Film: Pt on W(111).
Final rept.
K. J. Song, R. A. Demmin, C. Dong, E. Garfunkel, and T. E. Madey. 1990, 7p.
Pub. in Surface Science 227, n1-2 pL79-L85 1990.

Keywords: *Surfaces, Auger electron spectroscopy, Scanning tunneling microscopy, Metal films, Thin films, Platinum, Tungsten, Flat surfaces, Reprints, Low energy electron diffraction.

The interaction of ultrathin films of Pt with a W(111) surface has been studied using low energy electron diffraction (LEED), Auger electron spectroscopy (AES) and scanning tunneling microscopy (STM). When W(111) is covered with 1.1 x 10(sup 15) Pt atoms/sq cm and heated in the range 800 to 1600K, the surface undergoes a massive restructuring to form microscopic facets. At 1200K, the average facet dimensions are 100 A, and the dominant facet orientation is W(211). The faceting appears to be driven by a Pt-enhanced anisotropy in the surface free energy.

00,678
PB93-166288 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Metallurgy Div.
Barkhausen Jump Correlations in Thin Foils of Fe and Ni.
Final rept.
L. J. Swartzendruber, L. H. Bennett, H. Ettedgui, and I. Aviram. 1990, 3p.
Pub. in Jnl. of Applied Physics 67, n9 p5469-5471 1990.

Keywords: *Barkhausen effect, Foils(Materials), Microstructure, Signal analysis, Nickel, Iron, Reprints.

The Barkhausen noise emanating from the surface of thin foils of nearly pure iron and nickel was obtained by digitizing the noise signal over a complete hysteresis loop. This digitizing signal is used to analyze various attributes of the noise such as the autocorrelation, power density spectrum, jump amplitude spectrum, and jump amplitude correlation. For thin foils the power density exhibits a peak in the low-frequency range, contrary to what is predicted for a series of statistically independent Barkhausen jumps. Return maps and plots of jump amplitude vs. time between jumps show no evident deviation from random noise behavior. Thus, jump correlations or clustering do not explain the power density spectra, and an additional mechanism for the loss of low frequency power is required.

00,679
PB93-166296 Not available NTIS
National Inst. of Standards and Technology (IMSE), Gaithersburg, MD. Metallurgy Div.
Direct Evidence for an Effect of Twin Boundaries on Flux Pinning in Single Crystal of YBa2Cu3O6+x.
Final rept.
L. J. Swartzendruber, A. Roitburd, D. L. Kaiser, F. W. Gayle, and L. H. Bennett. 1990, 4p.
Pub. in Physical Review Letters 64, n4 p483-486 1990.

Keywords: *High temperature superconductors, *Flux pinning, *Superconductors, Single crystals, Critical current, Twinning, Anisotropy, Reprints, *Yttrium barium cuprates.

The magnetic properties of a nearly cubic single crystal of YBa2Cu3O(6+x) which displays predominantly one variant of twin boundary are reported. The cubic morphology has allowed a clear determination of the anisotropy of critical current density without the complication of large demagnetization factors. The observed anisotropy (Jc11/Jc1) is 62, which is higher than that reported previously for this material. Furthermore, small differences in magnetic behavior have been observed with the applied field parallel or perpendicular to the predominant twin boundary orientation, showing that twins may have a measurable effect on flux pinning. The lower critical field was measured with high precision, and the temperature dependence of the Ginzburg-Landau parameter was derived.

00,680
PB93-166338 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
Structure and Magnetic Properties of Doped Co and Fe-Bi2Sr2CuI-xMxOy Phases.
Final rept.
J. M. Tarascon, E. Tselepis, G. Pleizier, M. Giroud, M. Eibschutz, G. W. Hull, D. M. Hwang, P. Barboux, D. A. Neumann, Y. Lepage, W. R. McKinnon, P. F. Miceli, J. J. Rhyne, and L. H. Greene. 1989, 12p.
Pub. in Physical Review B 39, n16 p1587-1598 1989.

Keywords: *Superconductors, Crystal structure, Solid solutions, Magnetic susceptibility, Doped materials, Neutron scattering, Antiferromagnetism, Reprints, Bismuth strontium ferrate cuprates, Bismuth strontium cobaltate cuprates.

The structure and magnetic properties of the Bi2Sr2Cu(1-x)M(x)O(y) (M=Co and Fe) materials were studied. The limits of solid solution formation are at x=0.5 for the Fe system and x=1 for the Co system. Crystals of the new Bi2Sr2CoO(y) phase were grown and the structure established by x-ray crystallography. The subcell is the same as that of the 10K superconductor, Bi2Sr2CuO(y), but the superstructure

Is different, as it exhibits a commensurate modulation of periodicity 4 instead of 5. Extra oxygen is accommodated in the Bi layers, as in Bi2Sr3Fe2O(y), and the structure of the Bi-O layers can be described as 50% rocksalt-type and 50% oxygen-deficient perovskite for x=1, but with disorder at the oxygen positions. The formal valence of Co in this compound is about 2.5 + or - 0.2 as deduced from structural and chemical measurements, whereas Fe adopts the oxidation state +3 as deduced by Mossbauer measurements. Bi2Sr2CoO(y) is an antiferromagnetic insulator with the spins lying within the CoO2 sheets and the antiferromagnetic ordering temperature (T(N)) is sensitive to processing conditions and composition changes. The high anisotropy of the susceptibility suggests that Bi2Sr2CoO(y) may be an Ising or xy antiferromagnet.

00,681
PB93-166510 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Reactor Radiation Div.
Hydrogen Vibrational Modes and Anisotropic Potential in alpha-ScHx.
Final rept.
T. J. Udovic, J. J. Rush, I. S. Anderson, and R. G. Barnes. 1990, 6p.
Pub. in Physical Review B: Condensed Matter 41, n6 p3460-3465 1990.

Keywords: *Scandium hydrides, *Vibrational spectra, *Hydrogen, Neutron spectroscopy, High resolution, Anisotropy, Single crystals, Reprints.

The hydrogen vibrational spectra of single-crystal alpha-ScH(x) (x=0.05, 0.16, and 0.25) have been measured using incoherent inelastic neutron scattering methods. Results suggest that, although local ordering via hydrogen pairing across a Sc atom exists within alpha-ScH(x) at low temperature, ordering of the hydrogen pairs themselves along the c-axis is less extensive than in alpha-YH(x).

00,682
PB93-166544 Not available NTIS
National Inst. of Standards and Technology (NML), Gaithersburg, MD. Gas and Particulate Science Div.
SEM Analysis of Interactions between Platinum, Gold, and Silver-Palladium Capsules and Barium Yttrium Copper Oxide Superconductors.
Final rept.
J. R. Verkouteren. 1989, 5p.
Pub. in Materials Letters 8, n1-2 p59-63 1989.

Keywords: *Platinum, *Gold, *Silver alloys, *Palladium containing alloys, Scanning electron microscopy, Chemical reactivity, Chemical reactions, Capsules, Reprints, *Yttrium barium cuprates.

Quantitative compositional maps are used to determine the nature and extent of chemical reactions between melted BaO-Y2O3-CuO material and capsules of Pt, Au, and Ag(70)Pd(30). All three capsule materials are reactive with BYC superconductor compositions. The effect of the reactions on the results of phase equilibria experiments is discussed.

00,683
PB93-166643 Not available NTIS
National Inst. of Standards and Technology (IMSE), Gaithersburg, MD. Ceramics Div.
Structural Phase Transformation Studies of the High Tc Superconducting Materials, Ba2RCu3O6+x, in Air.
Final rept.
W. Wong-Ng, L. P. Cook, C. K. Chiang, F. Beech, L. J. Swartzendruber, L. H. Bennett, E. R. Fuller, M. D. Vaudin, and D. L. Kaiser. 1989, 17p.
See also PB90-242264. Sponsored by Electric Power Research Inst., Palo Alto, CA.
Pub. in High Temperature Superconducting Compounds: Processing and Related Properties, p553-569 1989.

Keywords: *High temperature superconductors, *Superconductors, Crystal-phase transformations, X-ray diffraction, Electron diffraction, Orthorhombic lattices, Tetragonal lattices, Stoichiometry, Reprints, Samarium barium cuprates, Gadolinium barium cuprates, Yttrium barium cuprates, Holmium barium cuprates, Erbium barium cuprates.

To understand the crystal chemistry and to gain more insight into the effect of oxygen stoichiometry on superconductivity, the authors have investigated the phase transformations between the orthorhombic and tetragonal structures of several high T(c) superconductors, Ba2RCu3O(6+x), where R = Sm, Gd, Y, Ho and Er, and x=0 to 1. Various techniques including X-ray diffraction, thermogravimetric analysis, neutron scattering, transmission electron microscopy, and determination of Meissner effect have been used to study the nature of the phase transition.

00,684
PB93-166668 Not available NTIS
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Crystal Chemistry and Phase Equilibria Studies of the BaO(BaCO3)-1/2R2O3-CuO Systems III: X-Ray Powder Characterization and Diffraction Patterns of Ba3R3Cu6O14+x, R=Lanthanides.
Final rept.
W. Wong-Ng, C. K. Chiang, B. Paretzkin, and E. R. Fuller. 1990, 7p.
Sponsored by Electric Power Research Inst., Palo Alto, CA.
Pub. in Powder Diffraction 5, n1 p26-32 Mar 90.

Keywords: *Superconductors, Tetragonal lattices, X-ray diffraction, Crystal chemistry, Solid solutions, Magnetic susceptibility, Electrical resistivity, Reprints, Barium praseodymium cuprates, Barium neodymium cuprates, Barium samarium cuprates, Barium europium cuprates, Phase equilibrium.

The superconductor related phases Ba3R3Cu6O(14+x) (or Ba(2-z)R(1+z)Cu3O(7+x), with z=0.5), where R = Pr, Nd, Sm, and Eu, have been prepared and characterized by X-ray powder diffraction, ac magnetic susceptibility measurement, resistivity measurement and thermogravimetric analysis (TGA). Attempts to make corresponding compounds with R = Gd, Dy, Y, Er, and Lu were not successful; they do not appear to form for rare-earth elements, R, with an ionic size smaller than Eu. The oxygen content of the successful materials was estimated by TGA. The Ba3R3Cu6Cu(14+x) compounds which were sintered at 950 C and annealed in oxygen at 550 C were found to be nonsuperconducting above 10K. Previously reported results for the R=La compound have indicated that it was superconducting with a transition temperature of 15K. The oxidation-reduction behavior of the Ba3R3Cu6O(14+x) materials is similar to that of the superconductor phases Ba2RCu3O(6+x).

00,685
PB93-166858 (Order as PB93-166817, PC A08)
National Inst. of Standards and Technology, Gaithersburg, MD.
Neutron Reflectivity and Grazing Angle Diffraction.
J. F. Ankner, C. F. Majkrzak, and S. K. Satija. 1993, 12p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n1 p47-58 Jan/Feb 93.

Keywords: *Neutron diffraction, Grazing incidence, Magnetic materials, Thin films, Superconductors, Superlattices, Interfaces, Polymers, Surfaces, *Neutron reflection, Neutron reflectometers, Multilayers.

Over the past 10 years, neutron reflectivity has emerged as a powerful technique for the investigation of surface and interfacial phenomena in many different fields. In the paper, a short review of some of the work on neutron reflectivity and grazing-angle diffraction as well as a description of the current and planned neutron reflectometers at NIST is presented. Specific examples of the characterization of magnetic, superconducting, and polymeric surfaces and interfaces are included.

00,686
PB93-166890 (Order as PB93-166817, PC A08)
National Inst. of Standards and Technology, Gaithersburg, MD.
Neutron Depth Profiling: Overview and Description of NIST Facilities.
R. G. Downing, G. P. Lamaze, J. K. Langland, and S. T. Hwang. 1993, 18p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n1 p109-126 Jan/Feb 93.

Keywords: *Surface analysis, Concentration(Composition), Nondestructive analysis, Cold neutrons, Boron, Lithium, Nitrogen, Oxygen, Silicon, Light ions, Resolution, Uses, *Neutron depth profiling, *Depth profiles, CNRF facility.

The Cold Neutron Depth Profiling (CNDP) instrument at the NIST Cold Neutron Research Facility (CNRF) is now operational. The neutron beam originates from a 16 L D2O ice cold source and passes through a filter of 135 mm of single crystal sapphire. The neutron energy spectrum may be described by a 65 K Maxwellian distribution. The sample chamber configuration allows for remote controlled scanning of 150 x 150 mm sample areas including the varying of both sample and detector angle. The improved sensitivity over the current thermal depth profiling instrument has permitted the first nondestructive measurements of (17)O profiles. The paper describes the CNDP instrument, illustrates the neutron depth profiling (NDP) technique with examples, and gives a separate bibliography of NDP publications.

00,687
PB93-207157 PC A04/MF A01
National Inst. of Standards and Technology (MSEL), Gaithersburg, MD. Ceramics Div.
Workshop on Characterizing Diamond Films II. Held in Gaithersburg, MD. on February 24-25, 1993.
A. Feldman, C. Beetz, P. Klocek, and G. Lu. May 93, 58p, NISTIR-5198.
See also PB92-205426. Prepared in cooperation with Advanced Technology Materials, Inc., Danbury, CT., Texas Instruments, Inc., Dallas, and Norton Diamond Film, Northboro, MA.

Keywords: *Meetings, *Chemical vapor deposition, *Diamonds, Thin films, Standards, Mechanical properties, Thermal conductivity, Raman spectroscopy, Quality assurance.

The second in a series of workshops was held at NIST on February 24th and 25th 1993 to discuss in depth specific topics deemed important to the characterization of diamond films made by chemical vapor deposition (CVD diamond) and to address the need for standards in diamond technology. University scientists and scientists from government laboratories were invited as experts in properties measurements. There were 44 attenders at the workshop. The authors focussed on three technical topics for discussion: characterization of optical absorption and scattering for optical applications; electronic characterization-metallization and electronic contacts for electronic applications; and, standardization of thermal conductivity measurement. In addition, a short session presented some new developments in Raman measurements and in thermal conductivity measurements.

00,688
PB94-108461 PC A09/MF A02
National Inst. of Standards and Technology, Gaithersburg, MD.
Journal of Research of the National Institute of Standards and Technology, May-June 1993. Volume 98, Number 3.
1993, 187p.
See also PB94-108479 through PB94-108511 and PB94-108529. Also available from Supt. of Docs. as SN703-027-00052-1.

Keywords: *Research, Magnetic probes, Magnetic measurement, Network analysis, Linear systems, High temperature superconductors, X-ray diffraction, Line broadening, Biological preservation, Blood, Clinical chemistry, Quantum Hall effect, Serum volume losses.

Contents:
- Coil Probe Dimension and Uncertainties During Measurements of Nonuniform ELF Magnetic Fields;
- Characteristics of Unknown Linear Systems Deduced from Measured CW Magnitude;
- X-Ray Diffraction Line Broadening: Modeling and Applications to High-T(c) Superconductors;
- Evaluation of Serum Volume Losses During Long-Term Storage;
- Dependence of Quantized Hall Effect Breakdown Voltage on Magnetic Field and Current.

00,689
PB94-108495 (Order as PB94-108461, PC A09/MF A02)
National Inst. of Standards and Technology, Boulder, CO.
X-ray Diffraction Line Broadening: Modeling and Applications to High-(T sub c) Superconductors.
D. Balzar. 1993, 33p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n3 p321-353 May/Jun 93.

Keywords: *High temperature superconductors, *X-ray diffraction, *Line broadening, *Superconductors, BSCCO superconductors, Stacking faults, Crystal defects, Lanthanum strontium cuprates, Warren-Averbach method, Voigt functions.

A method for analyzing the pure-specimen (structural) broadening of x-ray diffraction line profiles is proposed. By modeling the specimen size and strain broadenings with the simple Voigt function, it is possible to obtain domain sizes and strains that agree with experiment and show a logical interrelationship. Furthermore, some common consequences and problems in the Fourier-method analysis follow easily. The specimen function is convoluted with the instrumental function to match the observed x-ray diffraction-line profile. This avoids the Stokes deconvolution method, thus allowing analysis of patterns with highly overlapping peaks and weak structural broadening. Therefore, the method was applied to some novel high-Tc superconductors. Results are discussed.

00,690
PB94-108511 (Order as PB94-108461, PC A09/MF A02)
National Inst. of Standards and Technology, Gaithersburg, MD.
Dependence of Quantized Hall Effect Breakdown Voltage on Magnetic Field and Current.
M. E. Cage. 1993, 13p.
Included in Jnl. of Research of the National Institute of Standards and Technology, v98 n3 p361-373 May/Jun 93.

Keywords: Aluminum gallium arsenides, Molecular beam epitaxy, Two dimensional, Electron gas, Electric current, Magnetic fields, *Quantum Hall effect, Breakdown voltage, Resistance standards, Landau levels, Heterostructures.

When large currents are passed through a high-quality quantized Hall resistance device the voltage drop along the device is observed to assume discrete, quantized states if the voltage is plotted versus the magnetic field. These quantized dissipative voltage states are interpreted as occurring when electrons are excited to higher Landau levels and then return to the original Landau level. The quantization is found to be, in general, both a function of magnetic field and current. Consequently, it can be more difficult to verify and determine dissipative voltage quantization than previously suspected.

00,691
PB94-111523 PC A03/MF A01
National Inst. of Standards and Technology (CAML), Gaithersburg, MD. Applied and Computational Mathematics Div.
Morphological Instability in Phase-Field Models of Solidification.
R. J. Braun, G. B. McFadden, and S. R. Coriell. Oct 93, 48p, NISTIR-5279.

Keywords: *Crystal growth, *Solidification, Partial differential equations, Mathematical models, Perturbation theory, Asymptotic methods, Dispersion relations, Numerical solution, Instability, Crystal-melt interface, Phase field models.

The authors analyze the linear stability of a planar front with sharp-interface and phase-field models of solidification in two physical situations: (1) an isothermal system at the melt temperature in the undisturbed state, and (2) constant-speed growth of a crystal into its hypercooled melt. The parameters in the phase-field models are chosen to scale with the nondimensional interface thickness so that in the limit of vanishing interface-thickness, the sharp-interface model is recovered. Comparison of the results from the two models shows that as the interface between the melt and solid thickens: (1) the surface energy of the interface is apparently increased, and (2) the interfacial attachment kinetics are apparently faster as long as the interface is not too thick. If the interface thickness is on the order of the capillary length, then the attachment kinetics may appear either slower or faster than for sharp-interface models. Stability results for the planar front under 'heat trapping' conditions are obtained.

00,692
PB94-120680 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Boulder, CO. Electromagnetic Technology Div.
Analysis of the Impact on U.S. Industry of the NIST/Boulder Superconductivity Programs: An Interim Study.
R. L. Peterson. Nov 93, 33p, NISTIR-5012.

Keywords: *Superconductors, *Electronics industry, *United States, Economic analysis, Benefit cost analysis, Electromagnets, Superconductivity, Electrical properties, Josephson junctions, Solid state physics, *Superconducting electronics, HTS(High-temperature superconductivity), MRI(Magnetic resonance imaging), LTS(Low-temperature superconductivity), A/D(Analog-to-digital).

The report is an interim study of the impact of the National Institute of Standards and Technology (NIST)/Boulder superconductivity programs on U.S. industry. In the report, numerical estimates are made of the return on investment for areas which could be quantified. Anecdotal material and consideration of unquantified impacts are also included, and a survey of 40 U.S. companies or separate groups within companies in the U.S. superconductor industry is made. Small, medium, and large companies are represented equally among the 40 surveyed. All respondents indicated benefit from the NIST/Boulder programs. No negative comments were made. In superconducting electronics, the greatest impact on U.S. industry of the NIST work has been from the Josephson junction voltage standards developed at NIST. Every U.S. superconducting-wire manufacturer uses the measurement methods established by NIST for accurate determination of the critical parameters of the wire with which superconducting magnets are made. An industry in high-temperature superconductivity is just emerging, with the NIST work providing the foundations for this innovative technology.

00,693
PB94-123064 PC A03/MF A01
National Inst. of Standards and Technology (MEL), Gaithersburg, MD.
Nanofabrication Technology in Japan. (Japan Technology Program).
J. A. Dagata. Oct 93, 50p, NISTIR-5289.

Keywords: *Electronics, *Optical equipment, Computer applications, Fiber optics, Semiconductors(Materials), Manufacturing, Research and development, Tests, Laboratories, Japan, *Nanotechnology.

The report is intended to serve several purposes: First, it provides a detailed technical summary of research activity in nanofabrication technology which is underway currently at major facilities in Japan. Major examples of this activity are described in Section II. Taken as a whole, these efforts have generated considerable recent interest within the U.S. scientific community. Many articles and reports have already appeared in specialized journals, as well as in the popular scientific press (2-5). What is striking to many researchers and program managers, even long-time supporters of nanotechnology efforts in the United States, is the apparently firm commitment of Japan's industrial sector to support a sustained, basic research effort in the field.

Structural Mechanics

00,694
PB93-166312 Not available NTIS
National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Scientific Computing Div.
Built-in Error Estimator for Optimizing Finite Element Modeling.
Final rept.
J. Tang, J. T. Fong, and D. E. Dietrich. 1989, 16p.
Pub. in Proceedings of ASME (American Society of Mechanical Engineers) Pressure Vessels and Piping Conference, Honolulu, HI., July 23-27, 1989, p73-88.

Keywords: *Stress analysis, *Finite element method, *Mathematical models, Mechanics, Elastic properties, Computer calculations, Computational grids, Optimization, Structural analysis, Parameter identification, Grid generation(Mathematics), Reprints.

Using two newly-introduced commands (*SET and *GET) of a FORTRAN-based general-purpose finite-element code named ANSYS, the authors develop two macros to monitor errors and automate mesh refinement for a class of stress analysis problems that possess degenerated cases of known exact solutions. By comparing the exact versus the approximate solutions of a degenerated problem at selected nodes of a specific mesh design, they first develop a built-in error monitoring macro (EM-1) to assess the change of errors due to a small change of a key parameter of the given mesh. An 'optimal' mesh generating macro (OM-2) is then developed to automate the procedure of mesh refinement with the goal of limiting errors in selected variables to a prescribed error bound. The feasibility of this procedure is demonstrated through a benchmark problem where the stresses at the tip of an elliptical crack in an infinite plate subjected to a uniform uniaxial tension at infinity are computed. Significance of this approach to the evaluation of 'reliability' of finite element solutions of complex problems using a convergence monitoring macro (CM-3) is discussed.

PROBLEM-SOLVING INFORMATION FOR STATE & LOCAL GOVERNMENTS

Economic & Community Development

00,695
PB93-154458 PC A04/MF A01
National Governors' Association, Washington, DC. Center for Policy Research and Anaylsis.
Designing and Implementing a State Quality Award.
E. N. Dobson. Feb 93, 55p, NIST/GCR-92/620.
Sponsored by National Inst. of Standards and Technology, Gaithersburg, MD.

Keywords: *State programs, *Quality assurance, *Businesses, Productivity, Incentives, Economic development, Commercial development, Awards, Government/industry relations, Organizational structure, Financing, Case studies.

To remain competitive in today's global economy, businesses need to ensure customer satisfaction by offering high-quality products and services. Governors and state governments can play a critical role in ensuring the economic health of the business in their state by encouraging the adoption of quality practices and recognizing successful efforts by firms to improve quality and productivity. The manual is intended to help state government officials and other individuals implement a state quality award program.

SPACE TECHNOLOGY

General

00,696
PB94-113487 PC A11/MF A03
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
National Institute of Standards and Technology Conference on Reducing the Cost of Space Infrastructure and Operations. Part 2. Topical Papers. Held in Gaithersburg, Maryland on November 20-22, 1989.
W. C. Stone. Aug 93, 238p, NISTIR-5256.
See also PB94-111374.

Keywords: *Space transportation, *Cost engineering, *Meetings, Launch vehicles, Budgeting, Aerospace environments, Payloads, Research and development, Technology transfer.

Table of Contents: The Industrial Space Facility; The SPACE PHOENIX Program; External Tank Habitat; A Numerical Procedure for the Evaluation of Drag and Aerodynamic Torque for Convex Shells of Revolution in Low Earth Orbit; Autonomous Propulsion System Requirements for Placement of an STS External Tank in Low Earth Orbit, William C. Stone and Geraldine S. Cheok, NIST; EVA Life Cycle Cost Issues Summary; Flight Opportunity for Small Payloads; Commercial Launch Vehicles Using Hybrid Propulsion; Novel Integration Concepts; Payload Sensors; Cost Comparison Between the Space Flight and the Commercial Catalog Models of a Cesium Atomic Clock Module; Laser Propulsion Work at Lawrence Livermore National Laboratory; Pulsed-Laser Propulsion for Low Cost, High Volume Launch to Orbit, Jordin Kare, LLNL, Laser Propulsion and Possible Missions to Mars, Jordin Kare, LLNL;The Ram Accelerator as a Space Cargo Launcher; and Appendix A: List of Conference Participants.

Extraterrestial Exploration

00,697
N93-27980/0 (Order as N93-27956/0, PC A16/MF A03)
National Inst. of Standards and Technology, Gaithersburg, MD.
Intelligent Robots for Planetary Exploration and Construction.
J. S. Albus. Feb 92, 15p.
In Arizona Univ., Proceedings of the Lunar Materials Technology Symposium 15 p.

Keywords: *Robots, *Space exploration, Automatic control, Autonomous navigation, Construction, Lunar construction equipment, Lunar excavation equipment, Obstacle avoidance, Positioning devices (Machinery), Robot control, Trajectory planning, Walking machines, Excavation, Inflatable structures, Real time operation.

Robots capable of practical applications in planetary exploration and construction will require realtime sensory-interactive goal-directed control systems. A reference model architecture based on the NIST Real-time Control System (RCS) for real-time intelligent control systems is suggested. RCS partitions the control problem into four basic elements: behavior generation (or task decomposition), world modeling, sensory processing, and value judgment. It clusters these elements into computational nodes that have responsibility for specific subsystems, and arranges these nodes in hierarchical layers such that each layer has characteristic functionality and timing. Planetary exploration robots should have mobility systems that can safely maneuver over rough surfaces at high speeds. Walking machines and wheeled vehicles with dynamic suspensions are candidates. The technology of sensing and sensory processing has progressed to the point where real-time autonomous path planning and obstacle avoidance behavior is feasible. Map-based navigation systems will support long-range mobility goals and plans. Planetary construction robots must have high strength-to-weight ratios for lifting and positioning tools and materials in six degrees-of-freedom over large working volumes. A new generation of cable-suspended Stewart platform devices and inflatable structures are suggested for lifting and positioning materials and structures, as well as for excavation, grading, and manipulating a variety of tools and construction machinery.

Manned Spacecraft

00,698
N93-20205/9 (Order as N93-20178/8, PC A15/MF A03)
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Ignition and Subsequent Flame Spread over a Thin Cellulosic Material.
K. Nakabe, H. R. Baum, and T. Kashiwagi. Feb 93, 8p.
In NASA. Lewis Research Center, the Second International Microgravity Combustion Workshop p 229-236.

Keywords: *Cellulose, *Fire prevention, *Fires, *Flame propagation, *Ignition, *Reduced gravity, Gravitation, Mathematical models, Buoyancy, Entrainment, Navier-stokes equation, Plumes, Stagnation point, Vapor phases, *Spacecraft construction materials.

Both ignition and flame spread on solid fuels are processes that not only are of considerable scientific interest but that also have important fire safety applications. Both types of processes, ignition and flame spread, are complicated by strong coupling between chemical reactions and transport processes, not only in the gas phase but also in the condensed phase. In most previous studies, ignition and flame spread were studied separately with the result that there has been little understanding of the transition from ignition to flame spread. In fire safety applications this transition is crucial to determine whether a fire will be limited to a localized, temporary burn or will transition into a growth mode with a potential to become a large fire. In order to understand this transition, the transient mechanisms of ignition and subsequent flame spread must be studied. However, there have been no definitive experimental or modeling studies, because of the complexity of the flow motion generated by buoyancy near the heated sample surface. One must solve the full Navier-Stokes equations over an extended region to represent accurately the highly unstable buoyant plume and entrainment of surrounding gas from far away. In order to avoid the complicated nature of the starting plume problem under normal gravity, previous detailed radiative ignition models were assumed to be one-dimensional or were applied at a stagnation point. Thus, these models cannot be extended to include the transition to flame spread. The mismatch between experimental and calculated geometries means that theories cannot be compared directly with experimental results in normal gravity. To overcome the above difficulty, theoretical results obtained without buoyancy can be directly compared with experimental data measured in a microgravity environment. Thus, the objective of this study is to develop a theoretical model for ignition and the transition to flame spread and to make predictions using the thermal and chemical characteristics of a cellulosic material which are measured in normal gravity.

Space Launch Vehicles & Support Equipment

00,699
PB94-111374 PC A10/MF A03
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
National Institute of Standards and Technology Conference on Reducing the Cost of Space Infrastructure and Operations. Part 1. Oral Presentations and Discussion. Held in Gaithersburg, Maryland on November 20-22, 1989.
W. C. Stone. Aug 93, 206p, NISTIR-5255.
Supersedes PB94-109683.

Keywords: *Space transportation, *Cost engineering, *Meetings, Orbital space stations, Launch vehicles, Payloads, Aerospace environments, Research and development, Budgeting, Underwater environments, Hypobaric atmospheres, Technology transfer, Insurance.

A conference was held from November 20-22, 1989 at the National Institute of Standards and Technology in Gaithersburg, Maryland for the purpose of discussing methods for reducing the cost of space infrastructure and operations. This was a multidisciplinary group that included invited speakers from both within and outside of the traditional aerospace community. Specific comparison was made in the case of habitats and extravehicular activity with commercially successful undersea operations on earth which operate daily under more severe environmental conditions and with operating budgets on the order of 1/1000 that of orbital analogs.

TRANSPORTATION

Transportation Safety

00,700
PB93-219780 PC A08/MF A02
National Inst. of Standards and Technology (BFRL), Gaithersburg, MD.
Water Mist Fire Suppression Workshop Proceedings. Held in Gaithersburg, Maryland on March 1-2, 1993.
K. A. Notarianni, and N. H. Jason. Jun 93, 158p, NISTIR-5207.

Keywords: *Fire protection, *Meetings, *Spraying, *Marine accidents, *Aircraft fires, Sprinklers, Extinguishing, Sprayers, Mist, Sprinkler systems, Transportation safety, Telecommunication, Fire fighting, Fire extinguishers, Drops.

The water mist fire suppression workshop was organized to facilitate the commercialization of water mist technology in the United States. The imminent lack of availability of halon fire suppressants has sparked worldwide efforts in developing alternative fire fighting agents and delivery systems. Water mist systems are potential replacements in many industrial uses, as well as in new markets, such as commercial passenger aircraft. Speakers presented state-of-the-art papers on the incentives of using misting sprays, the advances in spray drop size measurement and the engineering criteria for water mist fire suppression systems. Three papers discussed projects demonstrating the use of water mist systems in aircraft, marine, and telecommunications applications. With this background the speakers and attendees were divided into three panels: research needs, end use criteria, and marketing. The purpose of the panel sessions was to identify the areas of concern relating to the commercialization of the water mist systems. The proceedings bring together the recommendations of each panel and the individual technical papers.

URBAN & REGIONAL TECHNOLOGY & DEVELOPMENT

Fire Services, Law Enforcement, & Criminal Justice

00,701
PB93-189827 PC A03/MF A01
National Inst. of Standards and Technology (EEEL), Gaithersburg, MD. Electricity Div.
Guide to Voice Privacy Equipment for Law Enforcement Radio Communications Systems.
P. M. Fulcomer. Mar 93, 39p, NISTIR-5155.
Sponsored by National Inst. of Justice, Washington, DC.

Keywords: *Speech scrambling, *Police, *Radio communication, Privacy, Security, Voice communication, Equipment, Manufacturers, Analog data, Digital communication.

There are various methods utilized to achieve voice privacy, with level of security, voice quality, effect on transmission range, complexity of operation and cost being some of the variables. The various methods can be separated into two major categories - analog and digital. The term 'scrambler' is often used for analog devices, whereas 'encryption' is used for the digital devices. The guide is intended to provide state and local law enforcement agencies with guidance in the selec-

tion and use of voice scrambling and encryption devices for use with personal/mobile transceivers. The information in it comes from both users and manufacturers, and from organizations that are working towards a new digital transmission standard.

Transportation & Traffic Planning

00,702
PB93-166429 Not available NTIS

National Inst. of Standards and Technology (NEL), Gaithersburg, MD. Law Enforcement Standards Lab.
IACP's Radar Testing Program Is Alive and Well. Final rept.
B. Traynor, R. Sostkowski, and M. Treado. 1989, 2p.
Sponsored by National Highway Traffic Safety Administration, Washington, DC.
Pub. in Police Chief, 2p Oct 89.

Keywords: *Radar equipment, *Traffic law enforcement, *Performance evaluation, Specifications, Test methods, Velocity measurement, Traffic surveillance, Measuring instruments, Highway safety, Speed indicators, Interagency cooperation, Reprints.

The article describes a joint program to improve the police traffic radar equipment used to enforce the national speed limit and other speed measurement laws. This joint program was initiated in 1977 with the enactment of an interagency agreement between NHTSA and NIST (NBS) and augmented by a cooperative agreement with the International Association of Chiefs of Police in 1982. With the cooperation of the manufacturers, there is presently in place a testing program to evaluate each new radar device. Effective October 1, 1989, this program will be enlarged to include the testing, at the manufacturer's expense, of devices periodically selected from production lines, to ensure compliance with established specifications. These tests will be conducted by university laboratories located in various parts of the country.

PERSONAL AUTHOR INDEX

SAMPLE ENTRY

DROUIN, N.
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PB93-189835 *00,261*

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AD-A258 836/6 *00,481* PC A03/MF A01

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AD-A261 193/7 *00,414* PC A18/MF A04

AD-A261 261/2
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AD-A261 270/3 *00,005* PC A07/MF A02

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AD-A261 751/2 *00,494* PC A10/MF A03

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Validation Summary Report: GTE Government Systems, Alsys Ada Software Development Environment, HP 9000 Series 800 Model 867 Under HP-UX BLS Version A.08.08 (Host and Target), 930115S1.11307.
AD-A262 055/7 *00,231* PC A16/MF A03

AD-A262 056/5
Validation Summary Report: GTE Government Systems, Alsys Ada Software Development Environment, HP 9000 Series 800 Model 867 Under HP-UX BLS Version A.08.08 (Host and Target), 930115S1.11308.
AD-A262 056/5 *00,232* PC A16/MF A03

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Validation Summary Report: GTE Government Systems, Alsys Ada Software Development Environment, HP 9000 Series 800 Model 807 UnderHP-UX BLS Version A.08.08 (Host and Target), 930115S1.11305.
AD-A262 253/8 *00,233* PC A17/MF A03

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Validation Summary Report: GTE Government Systems, Alsys Ada Software Development Environment, HP 9000 Series 800 Model 817 under HP-UX BLS Version A.08.08 (Host and Target), 930115S1.11306.
AD-A262 717/2 *00,234* PC A16/MF A03

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Validation Summary Report: GTE Government Systems, Alsys Ada Software Development Environment for 80386 UNIX, Version 5.1.2, Zenith Data Systems, Z-Station 433 DEh (Host and Target), 930115S1.11309.
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AD-A263 966/4 *00,117* Not available NTIS

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AD-A265 014/1 *00,238* PC A05/MF A01

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PB93-209781 *00,406* PC A16/MF A03

PB93-209922
Japan's Kohsetsushi Program of Regional Public Examinetion end Technology Centers for Upgrading Smell and Mid-Size Manufacturing Firms. Presented at Annual Meeting of the Association of American Geographers. Held in Miami, Florida in April 1991.
PB93-209922 *00,453* PC A03/MF A01

PB93-209930
Federal-State Collaboration in Industrial Modernization.
PB93-209930 *00,441* PC A04/MF A01

(Order as PB94-108529, MF A02)

PB94-108552

Phese Equilibria end Crystal Chemistry in Portions of the System SrO-CeO-Bi2O3-CuO. Pert 4. The System CeO-Bi2O3-CuO.
PB94-108552 *00,475*
(Order es PB94-108529, PC A08/MF A02)

PB94-108636

RL/NIST Workshop on Moisture Measurement and Control for Microelectronics. Proceedings of the RL/NIST Workshop held in Geithersburg, Maryland on April 5-7, 1993.
PB94-108636 *00,372* PC A16/MF A03

PB94-108644

Test Methods for Quentifying the Propensity of Cigarettes to Ignite Soft Furnishings.
PB94-108644 *00,047* PC A08/MF A02

PB94-108778

Metrology for Electromagnetic Technology: A Bibliography of NIST Publications.
PB94-108776 *00,341* PC A05/MF A01

PB94-109014

Modeling the Ignition of Soft Furnishings by e Cigarette.
PB94-109014 *00,048* PC A08/MF A02

PB94-109220

Validation Testing System: Reusable Software Component Design. National PDES Testbed Report Series.
PB94-109220 *00,427* PC A03/MF A01

PB94-109238

Present Worth Factors for Life-Cycle Cost Studies in the Department of Defense (1994).
PB94-109238 *00,540* PC A04/MF A01

PB94-109329

Clinical Trial of an Adhesive Material.
PB94-109329 *00,528* PC A04/MF A01

PB94-110186

NIST Measurement Service for Electromagnetic Characterization of Materials.
PB94-110186 *00,321* PC A03/MF A01

PB94-110194

Colleboreting with Our Customers: NIST Building end Fire Reseerch Laboratory.
PB94-110194 *00,029* PC A03/MF A01

PB94-111374

Netlonel Institute of Standards end Technology Conference on Reducing the Cost of Space Infrestructure end Operetions. Part 1. Oral Presentations and Discussion. Held in Gaithersburg, Maryland on November 20-22, 1989.
PB94-111374 *00,699* PC A10/MF A03

PB94-111424

Computetional Materials Science of Cement-Besed Materials: An Education Module.
PB94-111424 *00,188* PC A03/MF A01

PB94-111523

Morphological Instability in Phase-Field Models of Solidification.
PB94-111523 *00,691* PC A03/MF A01

PB94-111853

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PB94-111853 *00,373* PC A11/MF A03

PB94-111903

Energy Related Inventions Progrem. Status Report for Recommendations 1 through 350.
PB94-111903 *00,374* PC A09/MF A03

PB94-112166

Zone Fire Modeling with Netural Building Flows and e Zero Order Shaft Model.
PB94-112166 *00,030* PC A03/MF A01

PB94-112182

Research for Electric Energy Systems: An Annual Report, October 1993.
PB94-112182 *00,375* PC A03/MF A01

PB94-112257

Eerly Detection of Room Fires through Acoustic Emission.
PB94-112257 *00,031* PC A03/MF A01

PB94-112422

Report of the ARPA/NIST Workshop on Performence Evaluation of Unmanned Ground Vehicle Technologies.
PB94-112422 *00,456* PC A07/MF A02

PB94-112430

Intelligent Processing of Materials, Technical Activities 1992. (NAS-NRC Assessment Panel, Februery 2-3, 1993).
PB94-112430 *00,434* PC A04/MF A01

PB94-112448

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PB94-112448 *00,078* PC A03/MF A01

PB94-112455

Microcalorimeter for 7 mm Coaxial Transmission Line.
PB94-112455 *00,338* PC A04/MF A01

PB94-112497

Reference Model for Frameworks of Software Engineering Environments (Technical Report ECMA TR/55, 3rd Edition).
PB94-112497 *00,274* PC A07/MF A02

PB94-112547

Bibliography of the NIST Electromagnetic Fields Division Publications.
PB94-112547 *00,322* PC A06/MF A02

PB94-112802

Calculeting Cement Paste end Morter Diffusivity from Conductivity Meesurements: Preliminary Results of e New Method.
PB94-112802 *00,189* PC A03/MF A01

PB94-113081

Large Scale Evaluation of e Pattern Recognition/Expert System for Mass Spectrel Molecular Weight Estimetion.
PB94-113081 *00,108* PC A03/MF A01

PB94-113420

Impacts: NIST Building and Fire Research Laboratory (Technical and Societal).
PB94-113420 *00,079* PC A03/MF A01

PB94-113487

Netional Institule of Stendards and Technology Conference on Reducing the Cost of Space Infrestructure end Operetions. Part 2. Topical Papers. Held in Gaithersburg, Meryland on November 20-22, 1989.
PB94-113487 *00,696* PC A11/MF A03

PB94-113578

Airborne Asbestos Method: Standerd Test Method for Verified Analysis of Asbestos by Transmission Electron Microscopy. Version 1.0.
PB94-113578 *00,109* PC A02/MF A01

PB94-114501

SGML DTD for the STEP Integrated Resource Perts. Netional PDES Testbed Report Series.
PB94-114501 *00,428* PC A03/MF A01

PB94-114519

Smoke Plume Trajectory from In situ Burning of Crude Oil in Alaska.
PB94-114519 *00,393* PC A04/MF A01

PB94-114568

Detabases Availeble in the Research Information Center of the National Institute of Standards and Technology.
PB94-114568 *00,412* PC A07/MF A02

PB94-118056

Proceedings: Open Forum on Surge Protection Application.
PB94-118056 *00,346* PC A09/MF A02

PB94-118213

Comparison of Hendprinted Digit Classifiers.
PB94-118213 *00,306* PC A03/MF A01

PB94-118221

Portsmouth Festener Manufecturing Workstation. Fastener Engraving System (Design, Construction, end Operation).
PB94-118221 *00,461* PC A04/MF A01

PB94-118288

NIST Building end Fire Reseerch Laboratory. Projects 1993.
PB94-118288 *00,410* PC A07/MF A02

PB94-118403

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PB94-118403 *00,342* PC A03/MF A01

PB94-118460

FORTRAN Compiler Validation System 1978. User's Guide, Version 2.1.
PB94-118460 *00,275* PC A08/MF A02

PB94-118494

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PB94-118494 *00,617* PC A05/MF A01

PB94-119435

Guide to NIST.
PB94-119435 *00,002* PC A06/MF A02

PB94-120623

Shtolo-Converting STEP Short Listings to Annoteted Listings. Netlonel PDES Testbed Report Series.
PB94-120623 *00,435* PC A03/MF A01

PB94-120664

NIST EXPRESS Toolkit: Introduction end Overview. Netional PDES Testbed Report Series.
PB94-120664 *00,436* PC A03/MF A01

PB94-120680

Analysis of the Impact on U.S. Industry of the NIST/Boulder Superconductivity Programs: An Interim Study.
PB94-120680 *00,692* PC A03/MF A01

PB94-120797

Exppp: An EXPRESS Pretty Printer. Netionel PDES Testbed Report Series.
PB94-120797 *00,276* PC A03/MF A01

PB94-120847

NIST Serial Holdings, 1993.
PB94-120847 *00,413* PC A12/MF A03

PB94-120920

Integreted Services Digitel Network Conformence Testing. Layer 2, Dete Link Layer (LAPD). Part 1, Basic Rate Interface, User Side.
PB94-120920 *00,213* PC A99/MF E11

PB94-121050

Summeries of BFRL Fire Research In-House Projects end Grants, 1993.
PB94-121050 *00,032* PC A11/MF A03

PB94-121324

Annual Conference on Fire Research, 1993: Book of Abstrects.
PB94-121324 *00,205* PC A10/MF A03

PB94-123056

Results of Screened-Room Measurements on NIST Standerd Rediators.
PB94-123056 *00,323* PC A03/MF A01

PB94-123064

Nanofabrication Technology in Jepen. (Japan Technology Program).
PB94-123064 *00,693* PC A03/MF A01

PB94-500055

Building Life Cycle Cost Computer Program (BLCC), Version 4.11 (for Microcomputers).
PB94-500055 *00,042* CP D02

PB94-500097

Computer Program for Calculeting Time-of-Use, Block, and Demand Charges for Electricity Usage (ERATES), (Version 1.0) (for Microcomputers).
PB94-500097 *00,385* CP D02

REPT-28

Mechenical, Stress-Rupture, and Frecture Toughness Properties of Normelized end Stress Relieved AAR TC128 Grede B Steel et Eleveted Temperatures.
PB93-182020 *00,485* PC A03/MF A01

REPT-27

Frecture Mechenics Evaluation of Railroad Tank Cars Conteining Postuleted Circumferentiel Crecks.
PB93-219731 *00,486* PC A03/MF A01

REPT-92-1

Experimentel Study of Multiple Droplet Evaporative Cooling.
PB93-198463 *00,613* PC A06/MF A02

WRDC-TR-90-2070

Transient Hydrogen Heet Transfer.
AD-A266 615/4 *00,110* PC A03/MF A01

APPENDIX A
List of Depository Libraries in the United States

ALABAMA

Auburn

Auburn University Ralph Brown Draughon Library (1907)

Birmingham

Birmingham Public Library (1895)
Birmingham–Southern College Library (1932)
Jefferson State Community College James B. Allen Library (1970)
Samford University Library Harwell G. Davis Library (1884)

Enterprise

Enterprise State Junior College Learning Resources Center (1967)

Fayette

Bevill State Community College at Brewer Learning Resources Center (1979)

Florence

University of North Alabama Collier Library (1932)

Gadsden

Gadsden Public Library (1963)

Huntsville

University of Alabama in Huntsville Library (1964)

Jacksonville

Jacksonville State University Houston Cole Library (1929)

Maxwell Air Base

Air University Library (1963)

Mobile

Mobile Public Library (1963)
Spring Hill College Thomas Byrne Memorial Library (1937)
University of South Alabama Library (1968)

Montgomery

Alabama Public Library Service (1984)
Alabama Supreme Court and State Law Library (1884)
Auburn University at Montgomery Library (1971) REGIONAL

Normal

Alabama Agricultural and Mechanical University J. F. Drake Memorial Library Learning Resources Center (1963)

Troy

Troy State University Library (1963)

Tuscaloosa

University of Alabama Amelia Gayle Gorgas Library (1860) REGIONAL
University of Alabama School of Law Library (1967)

Tuskegee

Tuskegee University Hollis Burke Frissell Library (1907)

ALASKA

Anchorage

Anchorage Law Library (1973)
Anchorage Municipal Libraries Z. J. Loussac Public Library (1978)
Department of the Interior Alaska Resources Library (1981)
University of Alaska at Anchorage Consortium Library (1961)
U.S. Court Law Library (1983)

Fairbanks

University of Alaska Elmer E. Rasmuson Library (1922)

Juneau

Alaska State Library (1900)
University of Alaska Southeast William A. Egan Library (1981)

Ketchikan

Ketchikan Community College Library (1970)

AMERICAN SAMOA

Pago Pago

American Samoa Community College Learning Resources Center (1985)

ARIZONA

Apache Junction

Apache Junction Public Library (1992)

Coolidge

Central Arizona College Learning Resources Center (1973)

Flagstaff

Northern Arizona University Cline Library (1937)

Glendale

Glendale Public LIbrary (1986)

Mesa

Mesa Public Library (1983)

Phoenix

Arizona Department of Library Archives and Public Records (unknown) REGIONAL
Grand Canyon University Fleming Library (1978)
Maricopa County Library District (1993)
Phoenix Public Library (1917)
U.S. Court of Appeals Ninth Circuit Library (1984)

Prescott

Yavapai College Library (1976)

Tempe

Arizona State University Hayden Library/Government Documents (1970)
Arizona State University Ross-Blakley Law Library (1977)

Tucson

Tucson-Pima Public Library (1970)
University of Arizona College of Law Library (1991)
University of Arizona Main Library (1907)

Winslow

Northland Pioneer College Winslow Center LRC (1985)

Yuma

Yuma County District Library (1963)

ARKANSAS

Arkadelphia

Ouachita Baptist University Riley Hickingbotham Library (1963)

Batesville

Lyons College Mabee Library (1963)

Clarksville

University of the Ozarks Dobson Memorial Library (1925)

Conway

Hendrix College Olin C. Bailey Library (1903)

Fayetteville

University of Arkansas Mullins Library (1907)
University of Arkansas School of Law Library Robert A. Leflar (1978)

Jonesboro

Arkansas State University—Jonesboro Dean B. Ellis Library (1913)

Little Rock

Arkansas State Library (1978) REGIONAL
Arkansas Supreme Court Library (1962)
Central Arkansas Library System Main LIbrary (1953)
University of Arkansas at Little Rock Library Ottenheimer Library (1973)
University of Arkansas at Little Rock Pulaski County Law Library (1979)

Magnolia

Southern Arkansas University Magale Library (1956)

Monticello

University of Arkansas at Monticello Library (1956)

Pine Bluff

University of Arkansas at Pine Bluff Watson Memorial Library (1976)

Russellville

Arkansas Technical University Tomlinson Library (1925)

Searcy

Harding University Brackett Library (1963)

Walnut Ridge

Williams Baptist College Felix Goodson Library (1967)

CALIFORNIA

Anaheim

Anaheim Public Library (1963)

Arcadia

Arcadia Public Library (1975)

Arcata

Humboldt State University Library (1963)

Bakersfield

California State University Walter Stiern Library (1974)
Kern County, Beale Memorial Library (1943)

Berkeley

University of California General Library (1907)
University of California Boalt Hall Law Library (1963)

Carson

California State University Dominguez Hills Library (1973)
Carson Regional Library (1973)

Chico

California State University at Chico Merriam Library (1962)

Claremont

Claremont College Government Publications and Microforms Department Honnold/Mouth Library (1913)

Culver City

Culver City Library Los Angeles Public Library (1966)

Davis

University of California at Davis Shields Library (1953)
University of California at Davis Law Library (1972)

Downey

Downey City Library (1963)

Fresno

California State University at Fresno Henry Madden Library (1962)
Fresno County Free Library (1920)

Fullerton

California State University at Fullerton University Library (1963)

Garden Grove

Orange County Public Library (1963)

Hayward

California State University at Hayward Library (1963)

Inglewood

Inglewood Public Library (1963)

Irvine

University of California at Irvine Main Library (1963)

La Jolla

University of California at San Diego Central University Library (1963)

Lakewood

Angelo M. Iacoboni Public Library (1970)

Lancaster

Lancaster Public Library (1967)

La Verne

University of La Verne College of Law Library (1979)

Long Beach

California State University at Long Beach Library (1962)
Long Beach Public Library (1933)

Los Angeles

California State University at Los Angeles John F. Kennedy Memorial Library (1956)
Los Angeles County Law Library (1963)
Los Angeles Public Library (1891)
Loyola Law School William M. Rains Law Library (1979)
Occidental College Mary Norton Clapp Library (1941)
Southwestern University School of Law Library (1975)
University of California at Los Angeles University Research Library (1932)
University of California at Los Angeles Hugh & Hazel Darling Law Library (1958)
University of Southern California Doheny Memorial Library (1933)
University of Southern California Law Library (1978)
U.S. Court of Appeals Ninth Circuit Library (1981)
Whittier College School of Law Library (1978)

Malibu

Pepperdine University Payson Library (1963)

Menlo Park

U.S. Geological Survey Library (1962)

Montebello

Montebello Regional Library (1966)

Monterey

U.S. Naval Postgraduate School Dudley Knox Library (1963)

Monterey Park

Bruggemeyer Memorial Library (1964)

Northridge

California State University at Northridge Delmar T. Oviatt Library (1958)

Norwalk

Norwalk Regional Library (1973)

Oakland

Mills College Library (1966)
Oakland Public Library (1923)

Ontario

Ontario City Library (1974)

Palm Springs

Palm Springs Public Library (1980)

Pasadena

California Institute of Technology Millikan Memorial Library (1933)
Pasadena Public Library (1963)

Pleasant Hill

Contra Costa County Library (1964)

Redding

Shasta County Library (1956)

Redlands

University of Redlands Armacost Library (1933)

Redwood City

Redwood City Public Library (1966)

Reseda

West Valley Regional Branch Library Los Angeles Public Library (1966)

Richmond

Richmond Public Library (1943)

Riverside

Riverside City and County Public Library (1947)
University of California at Riverside Library (1963)

Sacramento

California State Library (1895) REGIONAL
California State University at Sacramento Library (1963)
Sacramento County Law Library (1963)
Sacramento Public Library (1880)
University of the Pacific McGeorge School of Law Gordon D. Schaber Law Library (1978)

San Bernardino

San Bernardino County Law Library (1984)
San Bernardino County Library (1964)

San Diego

San Diego County Law Library (1973)
San Diego County Library (1973)
San Diego Public Library (1895)
San Diego State University Library (1962)
University of San Diego Alcala Park School of Law Library (1967)

San Francisco

Golden Gate University Law Library (1979)
San Francisco Public Library (1889)
San Francisco State University J. Paul Leonard Library (1955)
Supreme Court of California Library (1979)
University of California Hastings College of Law Legal Information Center (1972)
University of San Francisco Richard A. Gleeson Library (1963)
U.S. Court of Appeals Ninth Circuit Library (1971)

San Jose

San Jose State University Clark Library (1962)

San Leandro

San Leandro Public Library Community Library Center (1961)

San Luis Obispo

California Polytechnic State University Robert F. Kennedy Library (1969)

San Mateo

College of San Mateo Library (1987)

San Rafael

Marin County Free Library (1975)

Santa Ana

Orange County Law Library (1975)
Santa Ana Public Library (1959)

Santa Barbara

University of California at Santa Barbara Library (1960)

Santa Clara

Santa Clara University Orradre Library (1963)

Santa Cruz

University of California at Santa Cruz McHenry Library (1963)

Santa Rosa

Sonoma County Library (1896)

Stanford

Stanford University Jonsson Library (1895)
Stanford University Robert Crown Law Library (1978)

Stockton

Public Library of Stockton and San Joaquin County (1884)

Thousand Oaks

California Lutheran University Pearson Library (1964)

Torrance

Torrance Public Library (1969)

Turlock

California State University, Stanislaus Library (1964)

Vallejo

Solano County Library System John F. Kennedy Library (1982)

Valencia

Valencia Library (1972)

Ventura

Ventura County Library E. P. Foster Library (1975)

Visalia

Tulare County Free Library (1967)

Walnut

Mount San Antonio College Learning Resources Library (1966)

West Covina

West Covina Regional Library (1966)

Whittier

Whittier College Wardman Library (1963)

COLORADO

Alamosa

Adams State College Library (1963)

Aurora

Aurora Public Library (1984)

Boulder

University of Colorado at Boulder Norlin Library (1879) REGIONAL
University of Colorado at Boulder School of Law Library (1988)

Broomfield

Mamie Doud Eisenhower Public Library

Colorado Springs

Colorado College Tutt Library (1880)
University of Colorado at Colorado Springs Library (1974)
U.S. Air Force Academy Library (1956)

Denver

Auraria Library (1978)
Colorado Supreme Court Library (1978)
Denver Public Library (1884) REGIONAL
Department of the Interior Bureau of Reclamation Library (1962)
Regis University Dayton Memorial Library (1915)
University of Denver College of Law Library Westminister Law Library (1978)
University of Denver Penrose Library (1909)
U.S. Courts Library (1973)

Fort Collins

Colorado State University Libraries (1907)

Golden

Colorado School of Mines Arthur Lakes Library (1939)

Grand Junction

Mesa County Public Library District (1975)
Mesa State College John Tomlinson Library (1985)

Greeley

University of Northern Colorado James A. Michener Library (1966)

Gunnison

Western State College of Colorado Leslie J. Savage Library (1932)

La Junta

Otero Junior College Wheeler Library (1963)

Lakewood

Jefferson County Public Library Lakewood Library (1968)

Pueblo

Pueblo Library District McClelland Library (1893)
University of Southern Colorado Library (1965)

CONNECTICUT

Bridgeport

Bridgeport Public Library (1884)
Quinnipiac College School of Law Library Wahlstrom Library (1979)

Danbury

Western Connecticut State University Ruth A. Haas Library (1967)

Hartford

Connecticut State Library (unknown) REGIONAL
Hartford Public Library (1945)

Trinity College Library (1895)
University of Connecticut School of Law Library (1978)

Middletown

Wesleyan University Olin Library (1906)

Mystic

Mystic Seaport Museum, Inc., G. W. Blunt White Library (1964)

New Britain

Central Connecticut State University Elihu Burritt Library (1973)

New Haven

Southern Connecticut State University Hilton C. Buley Library (1968)
Yale University Law Library (1981)
Yale University Seeley G. Mudd Library (1859)

New London

Connecticut College C. E. Shain Library (1926)
U.S. Coast Guard Academy Library (1939)

Stamford

Ferguson Library (1973)

Storrs

University of Connecticut Homer Babbidge Library (1907)

Waterbury

Silas Bronson Public Library (1869)
Teikyo Post University Traurig Library (1977)

West Haven

University of New Haven Marvin K. Peterson Library (1971)

DELAWARE

Dover

Delaware Division of Libraries (1992)
Delaware State University William C. Janson Library (1962)

Georgetown

Delaware Technical and Community College Southern Campus Library (1968)

Newark

University of Delaware Library (1907)

Wilmington

Widener University School of Law Library (1976)

DISTRICT OF COLUMBIA

Washington

Administrative Conference of the United States Library (1972)
Board of Governors of the Federal Reserve System Law Library (1976)
Board of Governors of the Federal Reserve System Research Library (1978)
American University Washington College of Law Library (1983)
Catholic University of America Robert J. White Law Library (1979)
Comptroller of the Currency Library (1986)
Department of Commerce Library (1955)
Department of Education Research Library (1988)
Department of Housing and Urban Development Library (1969)
Department of the Army Pentagon Library (1969)
Department of the Interior Natural Resources Library (1895)
Department of Justice Main Library (1895)
Department of Labor Library (1976)
Department of the Navy Library (1895)
Department of State Law Library (1966)
Department of State Library (1895)
Department of Transportation Main Library (1982)
Department of Transportation U.S. Coast Guard Law Library (1982)
Department of the Treasury Library (1895)
Department of Veterans' Affairs Central Office Library (1967)
District of Columbia Court of Appeals Library (1981)
District of Columbia Public Library (1943)
Equal Employment Opportunity Commission Library (1984)
Executive Office of the President Libraries (1965)
Federal Deposit Insurance Corporation Library (1972)
Federal Election Commission Law Library (1975)
Federal Energy Regulatory Commission Library (1983)
Federal Mine Safety & Health Review Commission Library (1976)
General Accounting Office Information Services Center (1974)
General Services Administration Library (1975)
Georgetown University Law Center Edward Bennett Williams Law Library (1978)
Georgetown University Library (1969)
George Washington University Melvin Gelman Library (1983)
George Washington University National Law Center Jacob Burns Law Library (1978)
Library of Congress Congressional Research Service (1978)
Library of Congress Serial and Government Publications Division (1977)
Merit Systems Protection Board Library (1979)
National Defense University Library (1895)
Office of Personnel Management Library (1963)
Pension Benefit Guaranty Corporation Office of General Counsel Library (1984)
U.S. Court of Appeals for the Federal Circuit Library (1986)
U.S. Court of Appeals Judges' Library (1975)
U.S. Information Agency Library (1984)
U.S. Postal Service Library (1895)
U.S. Senate Library (1979)
U.S. Supreme Court Library (1978)

FLORIDA

Boca Raton

Florida Atlantic University S. E. Wimberly Library (1963)

Bradenton

Manatee County Public Library (1991)

Casselberry

Seminole County Public Library System (1989)

Clearwater

Clearwater Public Library System (1991)

Coral Gables

University of Miami Otto G. Richter Library (1939)

Daytona Beach

Volusia County Public Library Volusia County Library Center (1963)

Deland

Stetson University duPont-Ball Library (1887)

Fort Lauderdale

Broward County Main Library (1967)
Nova Southeastern University Law Library (1967)

Fort Pierce

Indian River Community College Library (1975)

Gainesville

University of Florida College of Law Library (1978)
University of Florida Libraries (1907) REGIONAL

Jacksonville

Jacksonville Public Libraries (1914)
Jacksonville University Carl S. Swisher Library (1962)
University of North Florida Thomas G. Carpenter Library (1972)

Key West

Florida Keys Community College Key West Campus Library (1989)

Lakeland

Lakeland Public Library (1928)

Leesburg

Lake-Sumter Community College Library (1963)

Melbourne

Florida Institute of Technology Evans Library (1963)

Miami

Florida International University University Park Campus Library (1970)
Miami-Dade Public Library (1952)
St. Thomas University Library (1966)

North Miami

Florida International University North Miami Campus Library (1977)

Orlando

University of Central Florida Library (1966)

Palatka

Saint Johns River Community College Library (1963)

Panama City

Bay County Public Library (1983)

Pensacola

University of West Florida John C. Pace Library (1983)

Port Charlotte

Charlotte-Glades Library System (1973)

Saint Petersburg

Saint Petersburg Public Library (1965)
Stetson University College of Law Charles A. Dana Law Library (1975)

Sarasota

Selby Public Library (1970)

Tallahassee

Florida Agricultural and Mechanical University Coleman Memorial Library (1936)
Florida State University College of Law Library (1978)
Florida State University Strozier Library (1941)
Florida Supreme Court Library (1974)
State Library of Florida (1929)

Tampa

Tampa-Hillsborough County Public Library (1965)
University of South Florida Library (1962)
University of Tampa Merl Kelce Library (1953)

Winter Park

Rollins College Olin Library (1909)

GEORGIA

Albany

Dougherty County Public Library (1964)

Americus

Georgia Southwestern College James Earl Carter Library (1966)

Athens

University of Georgia Libraries (1907) REGIONAL
University of Georgia School of Law Library (1979)

Atlanta

Atlanta-Fulton Public Library (1880)
Atlanta University Center Robert W. Woodruff Library (1962)
Emory University Robert W. Woodruff Library (1928)
Emory University School of Law Library (1968)
Georgia Institute of Technology Price Gilbert Memorial Library (1963)
Georgia State Law Library (unknown)
Georgia State University College of Law Library (1983)
Georgia State University William Russell Pullen Library (1970)
U.S. Court of Appeals Eleventh Circuit Library (1980)

Augusta

Augusta College Reese Library (1962)
Medical College of Georgia Greenblatt Library (1986)

Brunswick

Brunswick-Glynn County Regional Library (1965)

Carrollton

West Georgia College Irvine Sullivan Ingram Library (1962)

Columbus

Columbus College Simon Schwob Memorial Library (1975)

Dahlonega

North Georgia College Stewart Library (1939)

Dalton

Dalton College Library Resources Center (1978)

Macon

Mercer University Main Library (1964)
Mercer University School of Law Library (1978)

Marietta

Kennesaw State College Horace W. Sturgis Library (1968)

Milledgeville

Georgia College Ina Dillard Russell Library (1950)

Mount Berry

Berry College Memorial Library (1970)

Rome

Berry College Memorial Library (1970)

Savannah

Chatham-Effingham-Liberty Regional Library (1857)

Statesboro

Georgia Southern College Zoch S. Henderson Library (1939)

Valdosta

Valdosta State College Odum Library (1956)

GUAM

Agana

Nieves M. Flores Memorial Library (1962)

Mangilao

University of Guam Robert F. Kennedy Memorial Library (1978)

HAWAII

Hilo

University of Hawaii at Hilo Edwin H. Mookini Library (1962)

Honolulu

Hawaii Medical Library Incorporated (1968)
Hawaii State Library (1929)
Municipal Reference & Records Center (1965)
Supreme Court Law Library (1973)
University of Hawaii Hamilton Library (1907) REGIONAL
University of Hawaii School of Law Library (1978)

Laie

Brigham Young University Hawaii Campus Joseph F. Smith Library (1964)

Lihue

Lihue Public Library (1967)

Pearl City

Leeward Community College Library (1967)

Wailuku

Wailuku Public Library (1962)

IDAHO

Boise

Boise Public Library (1929)
Boise State University Library (1966)
Idaho State Library (1971)
Idaho Supreme Court State Law Library (unknown)

Caldwell

Albertson College N. L. Terteling Library (1930)

Lewiston

Lewis-Clark State College The Library (1991)

Moscow

University of Idaho College of Law Library (1978)
University of Idaho Library (1907) REGIONAL

Nampa

Northwest Nazarene College John E. Riley Library (1984)

Pocatello

Idaho State University Eli Oboler Library (1908)

Rexburg

Ricks College David O. McKay Learning Resources Center (1946)

Twin Falls

College of Southern Idaho Library (1970)

ILLINOIS

Bloomington

Illinois Wesleyan University, Sheean Library (1964)

Bourbonnais

Olivet Nazarene University Benner Library and Resource Center (1946)

Carbondale

Southern Illinois University at Carbondale Morris Library (1932)
Southern Illinois University at Carbondale School of Law Library (1978)

Carlinville

Blackburn College Lumpkin Library (1954)

Carterville

John A. Logan College Learning Resources Center (1992)

Champaign

University of Illinois Law Library (1965)

Charleston

Eastern Illinois University Booth Library (1962)

Chicago

Chicago Public Library Harold Washington Library (1876)
Chicago State University Paul and Emily Douglas Library (1954)
DePaul University Law Library (1979)
Field Museum of Natural History Library (1963)
Illinois Institute of Technology Chicago-Kent College of Law Library (1978)
Illinois Institute of Technology Paul V. Galvin Library (1982)
John Marshall Law School Library (1981)
Loyola University of Chicago E. M. Cudahy Memorial Library (1966)
Loyola University School of Law Library (1979)
Northeastern Illinois University Ronald Williams Library (1961)
Northwestern University School of Law Library (1978)
University of Chicago D'Angelo Law Library (1964)
University of Chicago Library (1897)
University of Illinois at Chicago Library (1957)
William J. Campbell Library of the U.S. Courts (1979)

Decatur

Decatur Public Library (1954)

De Kalb

Northern Illinois University College of Law Library (1978)
Northern Illinois University Founders' Memorial Library (1960)

Des Plaines

Oakton Community College Library (1976)

Edwardsville

Southern Illinois University at Edwardsville Lovejoy Memorial Library (1959)

Elsah

Principia College Marshall Brooks Library (1957)

Evanston

Northwestern University Library (1876)

Freeport

Freeport Public Library (1905)

Galesburg

Galesburg Public Library (1896)

Jacksonville

MacMurray College Henry Pfeiffer Library (1990)

Lake Forest

Lake Forest College Donnelley Library (1962)

Lebanon

McKendree College Holman Library (1968)

Lisle

Illinois Benedictine College Theodore F. Lownik Library (1911)

Macomb

Western Illinois University Government Publications & Legal Reference Library (1962)

Moline

Black Hawk College Library (1970)

Monmouth

Monmouth College Hewes Library (1860)

Mount Carmel

Wabash Valley College Bauer Media Center (1975)

Mount Prospect

Mount Prospect Public Library (1990)

Normal

Illinois State University Milner Library (1877)

Oak Park

Oak Park Public Library (1963)

Oglesby

Illinois Valley Community College Jacobs Memorial Library (1976)

Palos Hills

Moraine Valley Community College Robert E. Turner Learning Resources Center (1972)

Peoria

Bradley University Cullom-Davis Library (1963)
Peoria Public Library (1883)

River Forest

Rosary College Rebecca Crown Library (1966)

Rockford

Rockford Public Library (1895)

Romeoville

Lewis University Library (1952)

South Holland

South Suburban College Learning Resources Center

Springfield

Illinois State Library (unknown) REGIONAL

Streamwood

Poplar Creek Public Library (1980)

University Park

Governors' State University Library (1974)

Urbana

University of Illinois at Urbana-Champaign Documents Library (1907)

Wheaton

Wheaton College Buswell Memorial Library (1964)

Woodstock

Woodstock Public Library (1963)

INDIANA

Anderson

Anderson Public Library (1983)
Anderson University Robert A. Nicholson Library (1959)

Bloomington

Indiana University Library (1881)
Indiana University School of Law Library (1978)

Crawfordsville

Wabash College Lilly Library (1906)

Evansville

Evansville-Vanderburgh County Public Library (1928)
University of Southern Indiana Library Services (1969)

Fort Wayne

Allen County Public Library (1896)
Indiana University-Purdue University at Fort Wayne (1965)

Franklin

Franklin College Library (1976)

Gary

Gary Public Library Main Library (1943)
Indiana University Northwest Library (1966)

Greencastle

DePauw University Roy O. West Library (1879)

Hammond

Hammond Public Library (1964)

Hanover

Hanover College Duggan Library (1892)

Huntington

Huntington College Richlyn Library (1964)

Indianapolis

Butler University Irwin Library (1965)
Indiana State Library (unknown) REGIONAL
Indiana Supreme Court Law Library (1975)
Indiana University School of Law Library (1967)
Indiana University-Purdue University at Indianapolis University Library (1979)
Indianapolis-Marion County Public Library (1906)

Kokomo

Indiana University Kokomo Library (1969)

Muncie

Ball State University Alexander M. Bracken Library (1959)
Muncie Public Library (1906)

New Albany

Indiana University Southeast Library (1965)

Notre Dame

University of Notre Dame Kresge Law Library (1985)
University of Notre Dame Theodore M. Hesburgh Library (1883)

Rensselaer

Saint Joseph's College Robinson Memorial Library (1964)

Richmond

Earlham College Lilly Library (1964)
Morrison-Reeves Library (1906)

South Bend

Indiana University at South Bend Franklin D. Schurz Library (1965)

Terre Haute

Indiana State University Cunningham Memorial Library (1906)

Valparaiso

Valparaiso University Law Library (1978)
Valparaiso University Moellering Memorial Library (1930)

West Lafayette

Purdue University Libraries (1907)

IOWA

Ames

Iowa State University Parks Library (1907)

Cedar Falls

University of Northern Iowa Donald O. Rod Library (1946)

Cedar Rapids

Cedar Rapids Public Library (1986)

Council Bluffs

Council Bluffs Public Library (1885)

Davenport

Davenport Public Library (1973)

Des Moines

Drake University Cowles Library (1966)
Drake University Law Library (1972)
Public Library of Des Moines (1888)
State Library of Iowa (unknown)

Dubuque

Carnegie-Stout Public Library (unknown)
Loras College Wahlert Memorial Library (1967)

Fayette

Upper Iowa University Henderson-Wilder Library (1972)

Grinnell

Grinnell College Burling Library (1874)

Iowa City

University of Iowa College of Law Library (1968)
University of Iowa Libraries (1884) REGIONAL

Lamoni

Graceland College F. M. Smith Library (1927)

Mason City

North Iowa Area Community College Library (1976)

Mount Vernon

Cornell College Russell D. Cole Library (1896)

Orange City

Northwestern College Ramaker Library (1970)

Sioux City

Sioux City Public Library (1894)

KANSAS

Atchison

Benedictine College Library (1965)

Baldwin City

Baker University Collins Library (1908)

Colby

Colby Community College H. F. Davis Memorial Library (1968)

Dodge City

Dodge City Community College Learning Resources Center (1991)

Emporia

Emporia State University William Allen White Library (1909)

Hays

Fort Hays State University Forsyth Library (1926)

Hutchinson

Hutchinson Public Library (1963)

Kansas City

Kansas City Kansas Community College Library (1992)

Lawrence

University of Kansas Government Documents and Maps Library (1869) REGIONAL
University of Kansas Law School Library (1971)

Manhattan

Kansas State University Farrell Library (1907)

Pittsburg

Pittsburg State University Leonard H. Axe Library (1952)

Salina

Kansas Wesleyan University Memorial Library (1930)

Shawnee Mission

Johnson County Library (1979)

Topeka

Kansas State Historical Society Library (1877)
Kansas State Library (1975)
Kansas Supreme Court Law Library (1975)
Washburn University of Topeka Law Library (1971)

Wichita

Wichita State University Ablah Library (1901)

KENTUCKY

Ashland

Ashland Community College Library (1990)

Barbourville

Union College Abigail E. Weeks Memorial Library (1958)

Bowling Green

Western Kentucky University Helm-Cravens Library (1934)

Columbia

Lindsey Wilson College Katie Murrell Library (1987)

Crestview Hills

Thomas More College Library (1970)

Danville

Centre College Grace Doherty Library (1884)

Frankfort

Kentucky Department of Libraries and Archives (1967)
Kentucky State Law Library (unknown)
Kentucky State University Paul G. Blazer Library (1972)

Hazard

Hazard Community College Library (1988)

Highland Heights

Northern Kentucky University W. Frank Steely Library (1973)

Lexington

University of Kentucky Law Library (1968)
University of Kentucky King Library South (1907) REGIONAL

Louisville

Louisville Free Public Library (1904)
University of Louisville Ekstrom Library (1925)
University of Louisville Law Library (1975)

Morehead

Morehead State University Camden-Carroll Library (1955)

Murray

Murray State University Waterfield Library (1924)

Owensboro

Kentucky-Wesleyan College Library Learning Center (1966)

Richmond

Eastern Kentucky University John Grant Crabbe Library (1966)

Williamsburg

Cumberland College Norma Perkins Hagan Memorial Library (1988)

LOUISIANA

Baton Rouge

Louisiana State University Middleton Library (1907) REGIONAL
Louisiana State University Paul M. Herbert Law Center Law Library (1929)

Southern University John B. Cade Library (1952)
Southern University Law Center Library (1979)
State Library of Louisiana (1976)

Eunice

Louisiana State University at Eunice Arnold LeDoux Library (1969)

Hammond

Southeastern Louisiana University Sims Memorial Library (1966)

Lafayette

University of Southwestern Louisiana Dupre Library (1938)

Lake Charles

McNeese State University Lether E. Frazar Memorial Library (1941)

Leesville

Vernon Parish Library (1991)

Monroe

Northeast Louisiana University Sandel Library (1963)

Natchitoches

Northwestern State University Watson Memorial Library (1887)

New Orleans

Law Library of Louisiana (unknown)
Loyola University Library (1942)
Loyola University Law Library (1978)
New Orleans Public Library (1883)
Our Lady of Holy Cross College Blaine S. Kern Library (1968)
Southern University at New Orleans Leonard S. Washington Library (1962)
Tulane University School of Law Library (1976)
Tulane University Howard-Tilton Memorial Library (1942)
U.S. Court of Appeals Fifth Circuit Library (1973)
University of New Orleans Earl K. Long Library (1963)
Xavier University Library (1991)

Pineville

Louisiana College Norton Memorial Library (1969)

Ruston

Louisiana Technical University Prescott Memorial Library (1896) REGIONAL

Shreveport

Louisiana State University in Shreveport Noel Memorial Library (1967)
Shreve Memorial Library (1923)

Thibodaux

Nicholls State University Ellender Memorial Library (1962)

MAINE

Augusta

Maine Law and Legislative Reference Library (1973)
Maine State Library (unknown)

Bangor

Bangor Public Library (1884)

Brunswick

Bowdoin College Hawthorne-Longfellow Library (1884)

Castine

Maine Maritime Academy Nutting Memorial Library (1969)

Lewiston

Bates College George and Helen Ladd Library (1883)

Orono

University of Maine Raymond H. Fogler Library (1907) REGIONAL

Portland

Portland Public Library (1884)
University of Maine School of Law Library Garbrecht Law Library (1964)

Presque Isle

University of Maine at Presque Isle Library (1979)

Sanford

Louis B. Goodall Memorial Library (1984)

Waterville

Colby College Miller Library (1884)

MARYLAND

Annapolis

Maryland State Law Library (unknown)
U.S. Naval Academy Nimitz Library (1895)

Baltimore

Enoch Pratt Free Library (1887)
Johns Hopkins University New Engineering Building Government/ Publication/Maps Law Library (1882)
Morgan State University Soper Library (1940)
University of Baltimore Langsdale Library (1973)
University of Baltimore Law Library (1980)
University of Maryland School of Law Library Marshall Law Library (1969)
U.S. Court of Appeals Fourth Circuit Library (1982)

Bel Air

Harford Community College Library (1967)

Beltsville

Department of Agriculture National Agricultural Library (1895)

Bethesda

Department of Health and Human Services National Library of Medicine (1978)
Uniformed Services University of Health Sciences Learning Resources Center (1983)

Catonsville

University of Maryland Baltimore County Albin O. Kuhn Library & Gallery (1971)

Chestertown

Washington College Clifton M. Miller Library (1891)

College Park

University of Maryland at College Park McKeldin Library (1925) REGIONAL

Cumberland

Allegany Community College Library (1974)

Frostburg

Frostburg State University Library (1967)

Patuxent River

Patuxent River Central Library (1968)

Rockville

Montgomery County Department of Public Libraries Rockville Regional Library (1951)

Salisbury

Salisbury State University Blackwell Library (1965)

Silver Spring

Department of Commerce NOAA Central Library (1993)

Towson

Goucher College Julia Rogers Library (1966)
Towson State University Albert S. Cook Library (1979)

Westminster

Western Maryland College Hoover Library (1886)

MASSACHUSETTS

Amherst

Amherst College Library (1884)
University of Massachusetts University Library (1907)

Boston

Boston Athenaeum Library (unknown)
Boston Public Library (1859) REGIONAL
Boston University School of Law Pappas Law Library (1979)
Northeastern University Snell Library (1962)
State Library of Massachusetts (unknown)
Suffolk University Law Library (1979)
Supreme Judicial Court Social Law Library (1979)
U.S. Court of Appeals First Circuit Library (1978)

Brookline

Public Library of Brookline (1925)

Cambridge

Harvard College Library (1860)
Harvard Law School Library (1981)
Massachusetts Institute of Technology Libraries (1946)

Chestnut Hill

Boston College Thomas P. O'Neill Jr. Library (1963)

Chicopee

College of Our Lady of the Elms Alumnae Library (1969)

Lowell

University of Massachusetts-Lowell O'Leary Library (1952)

Medford

Tufts University Wessell Library (1899)

Milton

Curry College Levin Library (1972)

New Bedford

New Bedford Free Public Library (1858)

Newton Center

Boston College Law School Library (1979)

North Dartmouth

University of Massachusetts-Dartmouth Library (1965)

North Easton

Stonehill College Cushing-Martin Library (1962)

Springfield

Massachusetts Trial Court Hampden Law Library (1992)
Springfield City Library (1966)
Western New England College School of Law Library (1978)

Waltham

Brandeis University Library (1965)

Wellesley

Wellesley College Margaret Clapp Library (1943)

Wenham

Gordon College Jenks Learning Resource Center (1963)

Williamstown

Williams College Sawyer Library (unknown)

Worcester

American Antiquarian Society Library (1814)
University of Massachusetts Medical Center Lamar Soutter Library (1972)
Worcester Public Library (1859)

MICHIGAN

Albion

Albion College Stockwell-Mudd Library (1966)

Allendale

Grand Valley State University Zumberge Library (1963)

Alma

Alma College Library (1963)

Ann Arbor

University of Michigan Harlan Hatcher Graduate Library (1884)
University of Michigan Law Library (1978)

Benton Harbor

Benton Harbor Public Library (1907)

Clinton Township

Macomb County Library (1968)

Dearborn

Henry Ford Community College Eshleman Library (1957)

Detroit

Detroit College of Law Library (1979)
Detroit Public Library (1868) REGIONAL
Marygrove College Library (1965)
University of Detroit Kresge Law Library (1978)
University of Detroit-Mercy McNichols Campus Library (1884)
Wayne State University Purdy/Kresge Library (1937)
Wayne State University Arthur Neef Law Library (1971)

Dowaglac

Southwestern Michigan College Fred L. Mathews Library (1971)

East Lansing

Michigan State University Government Documents Library (1907)

Farmington Hills

Oakland Community College King Learning Resources Center (1968)

Flint

Flint Public Library (1967)
University of Michigan-Flint Library (1977)

Grand Rapids

Calvin College & Seminary Library (1967)
Grand Rapids Public Library (1876)

Houghton

Michigan Technological University J. Robert Van Pelt Library (1876)

Jackson

Jackson District Library (1965)

Kalamazoo

Kalamazoo Public Library (1907)
Western Michigan University Dwight B. Waldo Library (1963)

Lansing

Library of Michigan (1860) REGIONAL
Thomas M. Cooley Law School Library (1978)

Livonia

Livonia Public Library (1987)
Schoolcraft College Eric J. Bradner Library (1962)

Madison Heights

Madison Heights Public Library (1982)

Marquette

Northern Michigan University Lydia M. Olson Library (1963)

Monroe

Monroe County Library System (1974)

Mount Pleasant

Central Michigan University Charles V. Park Library (1958)

Muskegon

Hackley Public Library (1894)

Petoskey

North Central Michigan College Library (1962)

Pontiac

Oakland County Research Library 1992)

Port Huron

Saint Clair County Library (1876)

Rochester

Oakland University Kresge Library (1964)

Royal Oak

Royal Oak Public Library (1984)

Saginaw

Hoyt Public Library (1890)

Sault Ste. Marie

Lake Superior State University Kenneth Shouldice Library (1982)

Traverse City

Northwestern Michigan College Mark and Helen Osterlin Library (1964)

University Center

Delta College Library (1963)

Warren

Warren Public Library Arthur J. Miller Branch (1973)

Ypsilanti

Eastern Michigan University Library (1965)

MICRONESIA

Pohnpei State

College of Micronesia-FSM U.S. Government Documents Library (1982)

MINNESOTA

Bemidji

Bemidji State University A. C. Clark Library (1963)

Blaine

Anoka County Library (1971)

Collegeville

Saint John's University Alcuin Library (1954)

Duluth

Duluth Public Library (1909)
University of Minnesota-Duluth Library (1984)

Eagan

Dakota County Library—Westcott Branch (1983)

Edina

Hennepin County Library Southdale-Hennepin Area Library (1971)

Mankato

Mankato State University Memorial Library (1962)

Marshall

Southwest State University Library (1986)

Minneapolis

Minneapolis Public Library (1893)
University of Minnesota Law School Library (1978)
University of Minnesota Wilson Library (1907) REGIONAL

Moorhead

Moorhead State University Library (1956)

Morris

University of Minnesota, Morris, Rodney A. Briggs Library (1963)

Northfield

Carleton College The Library (1930)
Saint Olaf College Rolvaag Memorial Library (1930)

Saint Cloud

Saint Cloud State University, Learning Resources Center (1962)

Saint Paul

Hamline University School of Law Library (1978)
Minnesota State Law Library (unknown)
Saint Paul Public Library (1914)
University of Minnesota Saint Paul Campus Library (1974)
William Mitchell College of Law Library (1979)

Saint Peter

Gustavus Adolphus College Folke Bernadotte Memorial Library (1941)

Winona

Winona State University Maxwell Library (1969)

MISSISSIPPI

Cleveland

Delta State University W. B. Roberts Library (1975)

Columbus

Mississippi University for Women John Clayton Fant Memorial Library (1929)

Hattiesburg

University of Southern Mississippi Joseph A. Cook Memorial Library (1935)

Jackson

Jackson State University Henry Thomas Sampson Library (1968)
Millsaps College Millsaps-Wilson Library (1963)
Mississippi College School of Law Library (1977)
Mississippi Library Commission (1947)
Supreme Court of Mississippi State Law Library (unknown)

Lorman

Alcorn State University J. D. Boyd Library (1970)

Mississippi State

Mississippi State University Mitchell Memorial Library (1907)

University

University of Mississippi J. D. Williams Library (1883) REGIONAL
University of Mississippi James O. Eastland Law Library (1967)

MISSOURI

Cape Girardeau

Southeast Missouri State University Kent Library (1916)

Columbia

University of Missouri at Columbia Ellis Library (1862) REGIONAL
University of Missouri-Columbia Law Library (1978)

Fulton

Westminster College Reeves Library (1875)

Hillsboro

Jefferson College Library (1984)

Jefferson City

Lincoln University Inman E. Page Library (1944)
Missouri State Library (1963)
Missouri Supreme Court Library (unknown)

Joplin

Missouri Southern State College George A. Spiva Library (1966)

Kansas City

Kansas City Missouri Public Library (1881)
Rockhurst College Greenlease Library (1917)
University of Missouri at Kansas City Leon E. Bloch Law Library (1978)
University of Missouri at Kansas City Miller Nichols Library (1938)

Kirksville

Northeast Missouri State University Pickler Memorial Library (1966)

Liberty

William Jewell College Charles F. Curry Library (1900)

Maryville

Northwest Missouri State University B. D. Owens Library (1982)

Rolla

University of Missouri at Rolla Curtis Laws Wilson Library (1907)

Saint Charles

Lindenwood College Margaret Leggat Butler Library (1973)
Saint Charles City/County Library District Kisker Road Branch Library (1990)

Saint Joseph

River Bluffs Regional Library Central Library (1891)

Saint Louis

Maryville University Library (1976)
Saint Louis County Library (1970)
Saint Louis Public Library (1866)
Saint Louis University Law Library (1967)
Saint Louis University Pius XII Memorial Library (1866)
U.S. Court of Appeals Eighth Circuit Library (1972)
University of Missouri at Saint Louis Thomas Jefferson Library (1966)
Washington University John M. Olin Library (1906)
Washington University Freund Law Library (1978)

Springfield

Drury College F. W. Olin Library (1874)
Southwest Missouri State University Duane G. Meyer Library (1963)

Warrensburg

Central Missouri State University Ward Edwards Library (1914)

MONTANA

Billings

Montana State University Billings Library (1958)

Bozeman

Montana State University Renne Library (1907)

Butte

Montana Tech of the University of Montana Materials Processing Department/Documents (1901)

Havre

Montana State University-Northern Vande Bogart Library (1980)

Helena

Carroll College Corette Library (1974)
Montana State Library (1966)
State Law Library of Montana (1977)

Missoula

University of Montana Mansfield Library (1909) REGIONAL

NEBRASKA

Blair

Dana College C. A. Dana Life Library (1924)

Crete

Doane College Perkins Library (1944)

Fremont

Midland Lutheran College Luther Library (1924)

Kearney

University of Nebraska at Kearney Calvin T. Ryan Library (1962)

Lincoln

Nebraska Library Commission (1972)
Nebraska State Library (unknown)
University of Nebraska at Lincoln D. L. Love Memorial Library (1907) REGIONAL
University of Nebraska at Lincoln Marvin & Virginia Schmid Law Library (1981)

Omaha

Creighton University Reinert/Alumni Library (1964)
Creighton University Klutznick Law Library (1979)
Omaha Public Library W. Dale Clark Library (1880)
University of Nebraska at Omaha University Library (1939)

Scottsbluff

Scottsbluff Public Library (1925)

Wayne

Wayne State College U.S. Conn Library (1970)

NEVADA

Carson City

Nevada State Library and Archives (unknown)
Nevada Supreme Court Library (1973)

Elko

Elko County Library (1991)
Northern Nevada Community College Learning Resources Center (1992)

Las Vegas

Clark County Law Library (1988)
Las Vegas-Clark County Library District (1974)
University of Nevada at Las Vegas James Dickinson Library (1959)

Reno

National Judicial College Law Library (1979)
Nevada Historical Society Library (1974)
University of Nevada Libraries (1907) REGIONAL
Washoe County Library (1980)

NEW HAMPSHIRE

Concord

Franklin Pierce Law Center Library (1973)
New Hampshire Law Library (1994)
New Hampshire State Library (unknown)

Durham

University of New Hampshire Dimond Library (1907)

Hanover

Dartmouth College Baker Library (1884)

Henniker

New England College Danforth Library (1966)

Manchester

Manchester City Library (1884)
New Hampshire College H. A. B. Shapiro Memorial Library (1976)
Saint Anselm College Geisel Library (1963)

Nashua

Nashua Public Library (1971)

NEW JERSEY

Bayonne

Bayonne Free Public Library (1909)

Bloomfield

Bloomfield Public Library (1965)

Bridgeton

Cumberland County Library (1966)

Camden

Rutgers University Law School Library (1979)
Rutgers University Paul Robeson Library (1966)

East Brunswick

East Brunswick Public Library (1977)

East Orange

East Orange Public Library (1966)

Elizabeth

Free Public Library of Elizabeth (1895)

Glassboro

Rowan College of New Jersey Savitz Library (1963)

Hackensack

Johnson Free Public Library (1966)

Irvington

Irvington Public Library (1966)

Jersey City

Jersey City Public Library (1879)
Jersey City State College Forrest A. Irwin Library (1963)

Lawrenceville

Rider University Franklin F. Moore Library (1975)

Madison

Drew University Library (1939)

Mahwah

Ramapo College George T. Potter Library (1971)

Morristown

College of Saint Elizabeth Mahoney Library (1938)

Mount Holly

Burlington County Library (1966)

New Brunswick

Rutgers University Alexander Library (1907)

Newark

Newark Public Library (1906) REGIONAL
Rutgers University John Cotton Dana Library (1966)
Rutgers University Law School Ackerson Law Library (1979)
Seton Hall University Law Library (1979)

Newton

Sussex County Library (1986)

Phillipsburg

Phillipsburg Free Public Library (1976)

Plainfield

Plainfield Public Library (1971)

Pomona

Stockton State College Library (1972)

Princeton

Princeton University Firestone Library (1884)

Randolph

County College of Morris Sherman H. Masten Learning Resource Center (1975)

Shrewsbury

Monmouth County Library (1968)

South Orange

Seton Hall University Walsh Library (1947)

Teaneck

Fairleigh Dickinson University Weiner Library (1963)

Toms River

Ocean County College Library (1966)

Trenton

New Jersey State Library (unknown)
Trenton Public Library (1902)

Upper Montclair

Montclair State College Harry A. Sprague Library (1967)

Wayne

Wayne Public Library (1972)

West Long Branch

Monmouth College Guggenheim Memorial Library (1963)

Woodbridge

Free Public Library of Woodbridge (1965)

NEW MEXICO

Albuquerque

University of New Mexico Health Sciences Center Library (1973)
University of New Mexico School of Law Library (1973)
University of New Mexico General Library (1896) REGIONAL

Hobbs

New Mexico Junior College Pannell Library (1969)

Las Cruces

New Mexico State University Branson Library (1907)

Las Vegas

New Mexico Highlands University Donnelly Library (1913)

Portales

Eastern New Mexico University Golden Library (1962)

Santa Fe

New Mexico State Library (1960) REGIONAL
New Mexico Supreme Court Law Library (unknown)

Silver City

Western New Mexico University Miller Library (1972)

Socorro

New Mexico Institute of Mining & Technology New Mexico Tech Library (1984)

NEW YORK

Albany

Albany Law School Schaffer Law Library (1979)
New York State Library (unknown) REGIONAL
State University of New York at Albany University Library (1964)

Binghamton

State University of New York at Binghamton Glenn G. Bartle Library (1962)

Brockport

State University of New York at Brockport Drake Memorial Library (1967)

Bronx

Fordham University Library (1937)
Herbert H. Lehman College Library (1967)
New York Public Library (1987)
State University of New York Maritime College Stephen B. Luce Library (1947)

Bronxville

Sarah Lawrence College Esther Raushenbush Library (1969)

Brooklyn

Brooklyn College Library (1936)
Brooklyn Law School Library (1974)
Brooklyn Public Library Business Library (1984)
Brooklyn Public Library (1908)
Pratt Institute Library (1891)
State University of New York Medical Research Library (1958)

Buffalo

Buffalo and Erie County Public Library (1895)
State University of New York at Buffalo Charles B. Sears Law Library (1978)
State University of New York at Buffalo Lockwood Memorial Library (1963)

Canton

Saint Lawrence University Owen D. Young Library (1920)

Corning

Corning Community College Arthur A. Houghton Jr. Library (1963)

Cortland

State University College Cortland Memorial Library (1964)

Delhi

State University of New York College of Technology Resnick Library (1973)

East Islip

East Islip Public Library (1973)

Elmira

Elmira College Gannett Tripp Library (1956)

Farmingdale

State University of New York at Farmingdale Greenley Library (1917)

Flushing

Queens College Benjamin S. Rosenthal Library (1939)
Queens College of City University of New York Law School Library (1983)

Garden City

Adelphi University Swirbul Library (1966)

Geneseo

State University of New York at Geneseo Milne Library (1967)

Greenvale

Long Island University B. Davis Schwartz Memorial Library (1964)

Hamilton

Colgate University, Everett Needham Case Library (1902)

Hempstead

Hofstra University Axinn Library (1964)
Hofstra University School of Law Library (1979)

Huntington

Touro College School of Law Library (1985)

Ithaca

Cornell University Albert R. Mann Library (1943)
Cornell University Law School Library (1978)
Cornell University Olin Library (1907)

Jamaica

Queens Borough Public Library (1926)
Saint John's University Library (1956)
Saint John's University School of Law Library (1978)

Kings Point

U.S. Merchant Marine Academy Schuyler Otis Bland Library (1962)

Long Island City

Fiorello H. LaGuardia Community College Library (1981)

Middletown

Thrall Library (1986)

Mount Vernon

Mount Vernon Public Library (1962)

New Paltz

State University College at New Paltz Sojourner Truth Library (1965)

New York City

City College of City University of New York Cohen Library (1884)
College of Insurance Library (1965)
Columbia University Libraries (1882)
Columbia University School of Law Library (1981)
Cooper Union for the Advancement of Science and Arts Library (1930)
Fordham University Leo T. Kissam Memorial Law Library (1987)
Medical Library Center of New York (1976)
New York Law Institute Library (1909)
New York Law School Library (1979)
New York Public Library Astor Branch (1907)
New York Public Library Lenox Branch (1884)
New York University Elmer Holmes Bobst Library (1967)
New York University Law Library (1974)
U.S. Court of Appeals Second Circuit Library (1976)
Yeshiva University Chutick Law Library (1979)
Yeshiva University Pollack Library (1979)

Newburgh

Newburgh Free Library (1909)

Niagara Falls

Niagara Falls Public Library (1976)

Oakdale

Dowling College Library (1965)

Oneonta

State University College at Onenonta James M. Milne Library (1966)

Oswego

State University of New York at Oswego Penfield Library (1966)

Plattsburgh

State University College at Plattsburgh Benjamin F. Feinberg Library (1967)

Potsdam

Clarkson University Harriet Call Burnap Memorial Library (1938)
State University of New York-College at Potsdam Frederick W. Crumb Memorial Library (1964)

Poughkeepsie

Vassar College Library (1943)

Purchase

State University of New York at Purchase Library (1969)

Rochester

Rochester Public Library (1978)
University of Rochester Rush Rhees Library (1880)

Saint Bonaventure

Saint Bonaventure University Friedsam Memorial Library (1938)

Saratoga Springs

Skidmore College Library (1964)

Schenectady

Union College Schaffer Library (1901)

Southampton

Long Island University Southhampton Campus Library (1973)

Sparkill

St. Thomas Aquinas College Lougheed Library (1984)

Staten Island

Wagner College Horrmann Library (1953)

Stony Brook

State University of New York at Stony Brook Frank Melville Jr. Memorial Library (1963)

Syracuse

Onondaga County Public Library (1978)
Syracuse University E. S. Byrd Library (1878)
Syracuse University College of Law Library H. Douglas Barclay Law Library (1978)

Troy

Troy Public Library (1869)

Uniondale

Nassau Library System (1965)

Utica

State University of New York Institute of Technology Library (1977)
Utica Public Library (1885)

West Point

U.S. Military Academy Library (unknown)

White Plains

Pace University School of Law Library (1978)

Yonkers

Yonkers Public Library Getty Square Branch (1910)

Yorktown Heights

Mercy College Library (1976)

NORTH CAROLINA

Asheville

University of North Carolina at Asheville D. Hiden Ramsey Library (1965)

Boiling Springs

Gardner-Webb University Dover Memorial Library (1974)

Boone

Appalachian State University Carol Grotnes Belk Library (1963)

Buies Creek

Campbell University Carrie Rich Memorial Library (1965)

Burlington

Elon College Iris Holt McEwen Library (1971)

Chapel Hill

University of North Carolina at Chapel Hill Law Library (1978)
University of North Carolina at Chapel Hill Walter Royal Davis Library (1884) REGIONAL

Charlotte

Public Library of Charlotte and Mecklenburg County (1964)
Queens College Everett Library (1927)
University of North Carolina at Charlotte J. Murrey Atkins Library (1964)

Cullowhee

Western Carolina University Hunter Library (1953)

Davidson

Davidson College E. H. Little Library (1893)

Durham

Duke University School of Law Library (1978)
Duke University William R. Perkins Library (1890)
North Carolina Central University Law School Library (1979)
North Carolina Central University James E. Shepard Library (1973)

Fayetteville

Fayetteville State University Charles W. Chesnutt Library (1971)

Greensboro

North Carolina Agricultural and Technical State University F. D. Bluford Library (1937)
University of North Carolina at Greensboro Walter Clinton Jackson Library (1963)

Greenville

East Carolina University J. Y. Joyner Library (1951)

Laurinburg

Saint Andrews Presbyterian College DeTamble Library (1969)

Lexington

Davidson County Public Library (1971)

Mount Olive

Mount Olive College Moye Library (1971)

Pembroke

Pembroke State University Mary Livermore Library (1956)

Raleigh

Department of Cultural Resources Division of State Library (unknown)
North Carolina State University D. H. Hill Library (1923)
North Carolina Supreme Court Library (1972)

Rocky Mount

North Carolina Wesleyan College Pearsall Library (1969)

Salisbury

Catawba College Corriher-Linn-Black Library (1925)

Wilmington

University of North Carolina at Wilmington William M. Randall Library (1965)

Wilson

Barton College Hackney Library (1930)

Winston-Salem

Forsyth County Public Library Main Library (1954)
Wake Forest University Worrell Professional Center Library (1990)
Wake Forest University Z. Smith Reynolds Library (1902)

NORTH DAKOTA

Bismarck

Bismarck Veterans' Memorial Public Library (1967)
North Dakota State Library (1971)
North Dakota Supreme Court Law Library (unknown)
State Historical Society of North Dakota State Archives & Historical Research Library (1907)

Dickinson

Dickinson State University Stoxen Library (1968)

Fargo

North Dakota State University Library (1907) REGIONAL

Grand Forks

University of North Dakota Chester Fritz Library (1890) REGIONAL

Minot

Minot State University Gordon B. Olson Library (1925)

Valley City

Valley City State University Allen Memorial Library (1913)

NORTHERN MARIANA ISLANDS

Saipan

Northern Marianas College Olympio T. Borja Memorial Library (1988)

OHIO

Ada

Ohio Northern University Jay P. Taggart Law Library (1965)

Akron

Akron-Summit County Public Library (1952)
University of Akron Bierce Library (1963)
University of Akron School of Law Library (1978)

Alliance

Mount Union College Library (1888)

Ashland

Ashland University Library (1938)

Athens

Ohio University Alden Library (1886)

Bluffton

Bluffton College Musselman Library (1951)

Bowling Green

Bowling Green State University Jerome Library (1933)

Canton

Malone College Everett L. Cattel Library (1970)

Chardon

Chardon Public Library (1971)

Cincinnati

Public Library of Cincinnati and Hamilton County Main Library (1884)
University of Cincinnati College of Law Library (1978)
University of Cincinnati Langsam Library (1929)
U.S. Court of Appeals Sixth Circuit Library (1986)

Cleveland

Case Western Reserve University Freiberger Library (1913)
Case Western Reserve University School of Law Library (1979)
Cleveland Public Library (1886)
Cleveland State University Cleveland-Marshall College of Law Library Joseph W. Bartunek III Law Library (1978)
Cleveland State University Library (1966)
Municipal Reference Library (1970)

Cleveland Heights

Cleveland Heights-University Heights Public Library (1970)

Columbus

Capital University Law and Graduate Center Documents Department (1980)
Capital University Library (1968)
Columbus Metropolitan Main Library (1885)
Ohio State University College of Law Library (1984)
Ohio State University Libraries (1907)
Ohio Supreme Court Law Library (1973)
State Library of Ohio (unknown) REGIONAL

Dayton

Dayton and Montgomery County Public Library (1909)
University of Dayton Roesch Library (1969)
Wright State University Paul Laurence Dunbar Library (1965)

Delaware

Ohio Wesleyan University L. A. Beeghly Library (1845)

Elyria

Elyria Public Library (1966)

Findlay

University of Findlay Shafer Library (1969)

Gambier

Kenyon College Olin/Chalmers Libraries (1873)

Granville

Denison University Libraries (1884)

Hiram

Hiram College Teachout-Price Memorial Library (1874)

Kent

Kent State University Libraries (1962)

Marietta

Marietta College Dawes Memorial Library (1884)

Marion

Marion Public Library (1979)

Middletown

Miami University Middletown Gardner-Harvey Library (1970)

New Concord

Muskingum College Library (1966)

Oberlin

Oberlin College Library (1858)

Oxford

Miami University King Library (1909)

Portsmouth

Shawnee State University Library (1987)

Rio Grande

University of Rio Grande Jeanette Albiez Davis Library (1966)

Springfield

Clark County Public Library (1884)

Steubenville

Franciscan University of Steubenville John Paul II Library (1971)
Public Library of Steubenville and Jefferson County (1950)

Tiffin

Heidelberg College Beeghly Library (1964)

Toledo

Toledo-Lucus County Public Library (1884)
University of Toledo College of Law Library (1981)
University of Toledo William S. Carlson Library (1963)

University Heights

John Carroll University Grasselli Library (1963)

Westerville

Otterbein College Courtright Memorial Library (1967)

Westlake

Porter Public Library (1991)

Wilmington

Wilmington College S. Arthur Watson Library (1986)

Wooster

College of Wooster Andrews Library (1966)

Worthington

Worthington Public Library (1984)

Youngstown

Public Library of Youngstown and Mahoning County (1923)
Youngstown State University William F. Maag Library (1971)

OKLAHOMA

Ada

East Central University Linscheid Library (1914)

Alva

Northwestern Oklahoma State University J. W. Martin Library (1907)

Bethany

Southern Nazarene University R. T. Williams Learning Resources Center (1971)

Durant

Southeastern Oklahoma State University Henry G. Bennett Memorial Library (1929)

Edmond

University of Central Oklahoma Library (1934)

Enid

Public Library of Enid and Garfield County (1908)

Langston

Langston University G. Lamar Harrison Library (1941)

Lawton

Lawton Public Library (1987)

Norman

University of Oklahoma Bizzell Memorial Library (1893)
University of Oklahoma Law Library (1978)

Oklahoma City

Metropolitan Library System Downtown Library (1974)
Oklahoma City University Dulaney Browne Library (1963)
Oklahoma Department of Libraries (1893) REGIONAL

Shawnee

Oklahoma Baptist University Mabee Learning Center (1933)

Stillwater

Oklahoma State University Edmon Low Library (1907) REGIONAL

Tahlequah

Northeastern State University John Vaughan Library (1923)

Tulsa

Tulsa City-County Library System (1963)
University of Tulsa College of Law Library (1979)
University of Tulsa McFarlin Library (1929)

Weatherford

Southwestern Oklahoma State University Al Harris Library (1958)

OREGON

Ashland

Southern Oregon State College Library (1953)

Bend

Central Oregon Community College Library/Media Center (1985)

Corvallis

Oregon State University William Jasper Kerr Library (1907)

Eugene

University of Oregon Law Library (1979)
University of Oregon Library (1883)

Forest Grove

Pacific University Harvey W. Scott Memorial Library (1897)

Klamath Falls

Oregon Institute of Technology Library (1982)

La Grande

Eastern Oregon State College Walter M. Pierce Library (1954)

McMinnville

Linfield College Northup Library (1965)

Monmouth

Western Oregon State College Library (1967)

Pendleton

Blue Mountain Community College Library (1983)

Portland

Lewis and Clark College Aubrey R. Watzek Library (1967)
Multnomah County Library (1884)
Northwestern School of Law Paul L. Boley Law Library (1979)
Portland State University Branford P. Millar Library (1963) REGIONAL
Reed College Library Eric V. Houser Library (1912)
U.S Department of Energy Bonneville Power Administration Library (1962)

Salem

Oregon State Library (unknown)
Oregon Supreme Court Law Library (1974)
Willamette University College of Law Library (1979)
Willamette University Mark O. Hatfield Library (1969)

PANAMA

Balboa Heights

Panama Canal Commission Technical Resources Center (1963)

PENNSYLVANIA

Allentown

Muhlenberg College Trexler Library (1939)

Altoona

Altoona Area Public Library (1969)

Bethel Park

Bethel Park Public Library (1980)

Bethlehem

Lehigh University Library (1876)

Blue Bell

Montgomery County Community College Learning Resources Center (1975)

Bradford

University of Pittsburgh at Bradford Hanley Library (1979)

Broomall

Marple Public Library (1988)

California

California University of Pennsylvania Louis L. Manderino Library (1986)

Carlisle

Dickinson College Boyd Lee Spahr Library (1947)
Dickinson School of Law Sheeley-Lee Law Library (1978)

Cheyney

Cheyney University Leslie Pinckney Hill Library (1967)

Collegeville

Ursinus College Myrin Library (1963)

Coraopolis

Robert Morris College Library (1978)

Doylestown

Bucks County Free Library (1970)

East Stroudsburg

East Stroudsburg University Kemp Library (1966)

Erie

Erie County Library System (1897)

Greenville

Thiel College Langenheim Memorial Library (1963)

Harrisburg

State Library of Pennsylvania (unknown) REGIONAL
Widener University Harrisburg Campus School of Law Library (1989)

Haverford

Haverford College Magill Library (1897)

Indiana

Indiana University of Pennsylvania Stapleton Library (1962)

Johnstown

Cambria County Library System Glosser Memorial Library (1965)

Lancaster

Franklin and Marshall College Shadek-Fackenthal Library (1895)

Lewisburg

Bucknell University Ellen Clarke Bertrand Library (1963)

Mansfield

Mansfield University Library (1968)

Meadville

Allegheny College Lawrence Lee Pelletier Library (1907)

Millersville

Millersville University Helen A. Ganser Library (1966)

Monessen

Monessen Public Library (1969)

New Castle

New Castle Public Library (1963)

Newton

Bucks County Community College Library (1968)

Norristown

Montgomery County-Norristown Public Library (1969)

Philadelphia

Free Library of Philadelphia (1897)
Saint Joseph's University Francis A. Drexel Library (1974)
Temple University Paley Library (1947)
Temple University School of Law Library (1979)
U.S. Court of Appeals Third Circuit Library (1973)
University of Pennsylvania Biddle Law Library (1974)
University of Pennsylvania Library (1886)

Pittsburgh

Allegheny County Law Library (1977)
Carnegie Library of Pittsburgh Allegheny Regional Branch (1924)
Carnegie Library of Pittsburgh (1895)
Duquesne University School of Law Library (1978)
La Roche College John J. Wright Library (1974)
University of Pittsburgh Hillman Library (1910)
University of Pittsburgh School of Law Barco Law Library (1979)
U.S. Bureau of Mines Library (1962)

Pottsville

Pottsville Free Public Library (1967)

Reading

Reading Public Library (1901)

Scranton

Scranton Public Library (1895)

Shippensburg

Shippensburg University Ezra Lehman Memorial Library (1973)

Slippery Rock

Slippery Rock University Bailey Library (1965)

Swarthmore

Swarthmore College McCabe Library (1923)

University Park

Pennsylvania State University Pattee Library (1907)

Villanova

Villanova University Law School Library (1964)

Warren

Warren Library Association Warren Public Library (1885)

West Chester

West Chester University Francis Harvey Green Library (1967)

Wilkes-Barre

King's College D. Leonard Corgan Library (1949)

Williamsport

Lycoming College Snowden Memorial Library (1970)

Youngwood

Westmoreland County Community College Learning Resources Center (1972)

PUERTO RICO

Mayaguez

University of Puerto Rico Mayaguez Campus Library (1928)

Ponce

Pontifical Catholic University of Puerto Rico Encarnacion Valdes Library (1966)
Pontifical Catholic University of Puerto Rico School of Law Library (1978)

San Juan

University of Puerto Rico Jose M. Lazaro Library (1928)
University of Puerto Rico Law Library (1991)

RHODE ISLAND

Barrington

Barrington Public Library (1986)

Kingston

University of Rhode Island Library (1907)

Newport

U.S. Naval War College Library (1963)

Providence

Brown University John D. Rockefeller Jr. Library (unknown)
Providence College Phillips Memorial Library (1969)
Providence Public Library (1884)
Rhode Island College James P. Adams Library (1965)
Rhode Island State Law Library (1979)
Rhode Island State Library (1895)

Warwick

Warwick Public Library (1966)

Westerly

Westerly Public Library (1977)

Woonsocket

Woonsocket Harris Public Library (1977)

SOUTH CAROLINA

Aiken

University of South Carolina-Aiken Gregg-Graniteville Library (1989)

Charleston

Charleston Southern University L. Mendel Rivers Library (1967)
The Citadel Military College Daniel Library (1962)
College of Charleston Robert Scott Small Library (1869)

Clemson

Clemson University Robert Muldrow Cooper Library (1893) REGIONAL

Columbia

Benedict College Payton Learning Resources Center (1969)
South Carolina State Library (1895)
University of South Carolina Coleman Karesh Law Library (1983)
University of South Carolina Thomas Cooper Library (1884) REGIONAL

Conway

Coastal Carolina University Kimbel Library (1974)

Due West

Erskine College McCain Library (1968)

Florence

Florence County Library (1967)
Francis Marion University James A. Rogers Library (1970)

Greenville

Furman University James B. Duke Library (1962)
Greenville County Library (1966)

Greenwood

Lander University Jackson Library (1967)

Lancaster

University of South Carolina at Lancaster Medford Library (1990)

Orangeburg

South Carolina State University Miller F. Whittaker Library (1953)

Rock Hill

Winthrop University Dacus Library (1896)

Spartanburg

Spartanburg County Public Library (1967)

SOUTH DAKOTA

Aberdeen

Northern State University Williams Library (1963)

Brookings

South Dakota State University Hilton M. Briggs Library (1889)

Pierre

South Dakota State Library (1973)
South Dakota Supreme Court Library (1978)

Rapid City

Rapid City Public Library (1963)
South Dakota School of Mines and Technology Devereaux Library (1963)

Sioux Falls

Augustana College Mikkelsen Library (1969)
Sioux Falls Public Library (1903)

Spearfish

Black Hills State University E. Y. Berry Library (1942)

Vermillion

University of South Dakota I. D. Weeks Library (1889)

TENNESSEE

Bristol

King College E. W. King Library (1970)

Chattanooga

Chattanooga-Hamilton County Bicentennial Library (1908)
U.S. Tennessee Valley Authority Corporate Library (1976)

Clarksville

Austin Peay State University Felix G. Woodward Library (1945)

Cleveland

Cleveland State Community College Library (1973)

Columbia

Columbia State Community College John W. Finney Memorial Library (1973)

Cookeville

Tennessee Technological University Library (1969)

Jackson

Lambuth University Luther L. Gobbel Library (1967)

Jefferson City

Carson-Newman College Library (1964)

Johnson City

East Tennessee State University Sherrod Library (1942)

Knoxville

Knoxville County Public Library System Lawson-McGhee Library (1973)
University of Tennessee at Knoxville John C. Hodges Library (1907)
University of Tennessee Law Library (1971)

Martin

University of Tennessee at Martin Paul Meek Library (1957)

Memphis

Memphis-Shelby County Public Library (1896)
University of Memphis Cecil C. Humphreys School of Law Library (1979)
University of Memphis Libraries (1966)

Murfreesboro

Middle Tennessee State University Todd Library (1912)

Nashville

Fisk University Library (1965)
Public Library of Nashville and Davidson County Ben West Library (1884)
Tennessee State Library and Archives (unknown)
Tennessee State University Brown-Daniel Library (1972)
Vanderbilt University Alyne Queener Massey Law Library (1976)
Vanderbilt University Library (1884)

Sewanee

University of the South Jessie Ball duPont Library (1873)

TEXAS

Abilene

Abilene Christian University Margaret and Herman Brown Library (1911)
Hardin-Simmons University Rupert and Pauline Richardson Library (1940)

Arlington

Arlington Public Library (1970)
University of Texas at Arlington Library (1963)

Austin

Texas State Law Library (1972)
Texas State Library (unknown) REGIONAL
University of Texas at Austin Edie and Lew Wasserman Library (1966)
University of Texas at Austin General Libraries (1884)
University of Texas at Austin Tarlton Law Library (1965)

Baytown

Lee College Erma Wood Carlson Learning Resources Center (1970)

Beaumont

Lamar University Gray Library (1957)

Brownwood

Howard Payne University Walker Memorial Library (1964)

Canyon

West Texas A&M University Cornette Library (1928)

College Station

Texas A&M University-Sterling G. Evans Library (1907)

Commerce

East Texas State University James Gilliam Gee Library (1937)

Corpus Christi

Texas A&M University-Corpus Christi Library (1976)

Corsicana

Navarro College Learning Resources Center (1965)

Dallas

Dallas Baptist University Vance Memorial Library (1967)
Dallas Public Library (1900)
Southern Methodist University Fondren Library (1925)

Denton

University of North Texas Libraries (1948)

Edinburg

University of Texas-Pan American Library (1959)

El Paso

El Paso Public Library (1906)
University of Texas at El Paso Library (1966)

Fort Worth

Fort Worth Public Library (1905)
Texas Christian University Mary Couts Burnett Library (1916)

Galveston

Rosenberg Library (1909)

Garland

Nicholson Memorial Library System (1990)

Houston

Houston Public Library (1884)
North Harris College Learning Resources Center (1974)
Rice University Fondren Library (1967)
South Texas College of Law Library (1981)
Texas Southern University Thurgood Marshall School of Law Library (1982)
University of Houston-Clear Lake Library (1980)
University of Houston Law Center The O'Quinn Library (1979)
University of Houston M. D. Anderson Library (1957)

Huntsville

Sam Houston State University Newton Gresham Library (1949)

Irving

Irving Public Library System (1974)

Kingsville

Texas A&M University-Kingsville James C. Jernigan Library (1944)

Laredo

Laredo Junior College Harold R. Yeary Library (1970)

Longview

Longview Public Library (1961)

Lubbock

Texas Tech University Libraries (1935) REGIONAL
Texas Tech University School of Law Library (1978)

Nacogdoches

Stephen F. Austin State University Steen Library (1965)

Richardson

University of Texas at Dallas McDermott Library (1972)

San Angelo

Angelo State University Porter Henderson Library (1964)

San Antonio

Palo Alto College Learning Resources Center (1990)
Saint Mary's University Academic Library (1964)
Saint Mary's University Sarita Kenedy East Law Library (1982)
San Antonio College Library (1972)
San Antonio Public Library (1899)
Trinity University Elizabeth Coates Maddux Library (1964)
University of Texas at San Antonio Library (1973)

San Marcos

Southwest Texas State University Albert B. Alkek Library (1955)

Seguin

Texas Lutheran College Blumberg Memorial Library (1970)

Sherman

Austin College Gladys Abell Library Center (1963)

Texarkana

Texarkana College Palmer Memorial Library (1963)

Victoria

Victoria College University of Houston-Victoria Library (1973)

Waco

Baylor University Caston Law Library (1982)
Baylor University Moody Memorial Library (1905)

Wichita Falls

Midwestern State University Moffett Library (1963)

UTAH

Cedar City

Southern Utah University Library (1964)

Ephraim

Snow College Lucy A. Phillips Library (1963)

Logan

Utah State University Merrill Library (1907) REGIONAL

Ogden

Weber State University Stewart Library (1962)

Provo

Brigham Young University Harold B. Lee Library (1908)
Brigham Young University Law Library (1972)

Salt Lake City

University of Utah Eccles Health Science Library (1970)
University of Utah Law Library (1966)
University of Utah Marriott Library (1893)
Utah State Library (unknown)
Utah State Supreme Court Law Library (1975)

VERMONT

Burlington

University of Vermont Bailey/Howe Library (1907)

Castleton

Castleton State College Calvin Coolidge Library (1969)

Johnson

Johnson State College John Dewey Library (1955)

Lyndonville

Lyndon State College Samuel Reed Hall Library (1969)

Middlebury

Middlebury College Egbert Starr Library (1884)

Montpelier

Vermont Department of Libraries (1845)

Northfield

Norwich University Kreitzberg Library (1908)

South Royalton

Vermont Law School Library (1978)

VIRGIN ISLANDS

Saint Croix

Virgin Island Division of LIbraries c/o Florence Williams Public Library (1968)

Saint Thomas

University of the Virgin Islands Ralph M. Paiewonsky Library (1973)

VIRGINIA

Alexandria

Dept. of the Navy Office of Judge Advocate General Law Library (1963)

Arlington

George Mason University School of Law Library (1981)
U.S. Patent & Trademark Office Scientific Technology Information Center (1986)

Blacksburg

Virginia Polytechnic Institute and State University Libraries (1907)

Bridgewater

Bridgewater College Alexander Mack Memorial Library (1902)

Charlottesville

University of Virginia Alderman Library (1910) REGIONAL
University of Virginia Arthur J. Morris Law Library (1964)

Chesapeake

Chesapeake Public Library System (1970)

Danville

Danville Community College Learning Resources Center (1969)

Emory

Emory and Henry College Kelly Library (1884)

Fairfax

George Mason University Fenwick Library (1960)

Fredericksburg

Mary Washington College Simpson Library (1940)

Hampden-Sydney

Hampden-Sydney College Eggleston Library (1891)

Hampton

Hampton University William R. and Norma B. Harvey Library (1977)

Harrisonburg

James Madison University Carrier Library (1973)

Lexington

Virginia Military Institute Preston Library (1874)
Washington and Lee University James B. Leyburn Library (1910)
Washington and Lee University Wilbur C. Hall Law Library (1978)

Martinsville

Patrick Henry Community College Learning Resources Center (1971)

Norfolk

Norfolk Public Library System (1895)
Old Dominion University Library (1963)
U.S. Armed Forces Staff College Library (1963)

Petersburg

Virginia State University Johnston Memorial Library (1907)

Quantico

Federal Bureau of Investigation FBI Academy Library (1970)
Marine Corps Research Center C40RC James Carson Breckinridge Library (1967)

Reston

Department of the Interior Geological Survey Library (1963)

Richmond

Library of Virginia (unknown)
University of Richmond Boatwright Memorial Library (1900)
University of Richmond Law School Library (1982)
U.S. Court of Appeals Fourth Circuit Library (1973)
Virginia Commonwealth University James Branch Cabell Library (1971)
Virginia State Law Library (1973)

Roanoke

Hollins College Fishburn Library (1967)

Salem

Roanoke College Fintel Library (1886)

Williamsburg

College of William and Mary Earl Gregg Swem Library (1936)
College of William and Mary Marshall-Wythe Law Library (1978)

Wise

Clinch Valley College John Cook Wyllie Library (1971)

WASHINGTON

Bellevue

Bellevue Regional Library (1990)

Bellingham

Western Washington University Mable Zoe Wilson Library (1963)

Cheney

Eastern Washington University John F. Kennedy Library (1966)

Des Moines

Highline Community College Library (1983)

Ellensburg

Central Washington University Library (1962)

Everett

Everett Public Library (1914)

Olympia

Evergreen State College Daniel J. Evans Library (1972)
Washington State Law Library (1979)
Washington State Library (unknown) REGIONAL

Port Angeles

North Olympic Library System (1965)

Pullman

Washington State University Holland Library TSD (1907)

Seattle

Seattle Public Library (1908)
University of Washington Marian Gould Gallagher Law Library (1969)
University of Washington Suzzallo Library (1890)
U.S. Courts Library Ninth Circuit Library (1981)

Spokane

Gonzaga University School of Law Library (1979)
Spokane Public Library (1910)

Tacoma

Tacoma Public Library (1894)
University of Puget Sound Collins Memorial Library (1938)
University of Puget Sound School of Law Library (1978)

Vancouver

Fort Vancouver Regional Library (1962)

Walla Walla

Whitman College Penrose Memorial Library (1890)

WEST VIRGINIA

Athens

Concord College J. Frank Marsh Library (1924)

Bluefield

Bluefield State College Hardway Library (1972)

Charleston

Kanawha County Public Library (1952)
West Virginia Library Commission (1975)
West Virginia Supreme Court Law Library (1977)

Elkins

Davis and Elkins College Booth Library (1913)

Fairmont

Fairmont State College Library (1884)

Huntington

Marshall University James E. Morrow Library (1925)

Institute

West Virginia State College Drain-Jordan Library (1907)

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West Virginia Institute of Technology Vining Library (1985)

Morgantown

West Virginia University Library (1907) REGIONAL

Salem

Salem-Teikyo University Benedum Library (1921)

Shepherdstown

Shepherd College Ruth Scarborough Library (1971)

Weirton

Mary H. Weir Public Library (1963)

WISCONSIN

Appleton

Lawrence University Seeley G. Mudd Library (1869)

Beloit

Beloit College Col. Robert H. Morse Library (1888)

Eau Claire

University of Wisconsin-Eau Claire William D. McIntyre Library (1951)

Fond du Lac

Fond du Lac Public Library (1966)

Green Bay

University of Wisconsin-Green Bay Cofrin Library (1968)

La Crosse

La Crosse Public Library (1883)
University of Wisconsin-La Crosse Murphy Library (1965)

Madison

Madison Public Library (1965)
State Historical Society of Wisconsin Library (1870) REGIONAL
University of Wisconsin-Madison Law Library (1981)
University of Wisconsin-Madison Memorial Library (1939)
Wisconsin State Law Library (unknown)

Milwaukee

Alverno College Library/Media Center (1971)
Marquette University Law Library (1987)
Medical College of Wisconsin Libraries Todd Wehr Library (1980)
Milwaukee County Law and Reference Library (1934)
Milwaukee Public Library (1861) REGIONAL
Mount Mary College Haggerty Library (1964)
University of Wisconsin-Milwaukee Golda Meir Library (1960)

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University of Wisconsin-Platteville Karrmann Library (1964)

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Ripon College Library (1982)

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University of Wisconsin-River Falls Chalmer Davee Library (1962)

Sheboygan

Mead Public Library (1983)

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University of Wisconsin-Stevens Point University Library (1951)

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University of Wisconsin-Superior Jim Dan Hill Library (1935)

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Waukesha Public Library (1966)

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Marathon County Public Library (1971)

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Wyoming State Law Library (1977)
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Northwest College John Taggart Hinckley Library (1967)

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