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DOE NEW TECHNOLOGY

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U.S. DEPARTMENT OF ENERGY

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Prepared by
Office of Scientific and
Technical Information

OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION

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DOE New Technology

Support

DOE New Technology is prepared for DOE's Office of Technology Utilization under its technology transfer outreach program.

Purpose

The purpose of *DOE New Technology* is to provide information on how to access specific technologies developed through research sponsored by DOE and performed by DOE laboratories or by contracted researchers. This document describes technologies identified as having potential for commercial applications, in addition to a catalog of current patent applications and patents available for licensing from DOE and DOE contractors.

Content

DOE New Technology is divided into three sections. The first section, "New Technology from DOE," consists of technology assessments which are prepared by DOE laboratories whenever a research project is judged as having potential for commercial applications. These entries describe each technology and give a point of contact for more information. The second and third sections, "Patents Available for Licensing from DOE," and "Other Patents from Technologies Funded by DOE" include both current technologies' patents and patent applications. Technologies owned by DOE are announced at both the application and the patent stage, while technologies funded-but-not-owned by DOE are announced at patent stage only.

CAUTION: There are a variety of mechanisms by which others can take title to DOE-funded technologies; therefore, some of these patents may have changed ownership during the time covered by this publication.

These records are contained in the Energy Science and Technology Database and New Technology from DOE Database. These databases are available online to DOE and its contractors through the DOE Integrated Technology Information System (ITIS).

This issue contains information available from July 1991 to March 1992.

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Information regarding "New Technology from DOE" (Section I) should be addressed to the contact shown in the individual citation you are interested in having more information about. Technology Transfer contacts at each DOE facility are compiled for your convenience on page iv.

Information regarding DOE patents (Section II) and requests for license application forms should be addressed to Assistant General Counsel for Intellectual Property, U.S. Department of Energy, Washington, DC 20585.

Information regarding "Other Patents, from Technologies funded by DOE" (Section III) can be obtained from the appropriate corporate entity shown in the citation header.

Technical Editor, Amy Tamura
Managing Editor, Leota Kane

Laboratories

The DOE laboratories form a network composed of 9 multiprogram laboratories, 12 major single-program laboratories, and 11 smaller laboratories. Collectively, the laboratories are a significant national resource, and their diversity encompasses all of the major scientific and engineering disciplines.

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Technology Transfer and Industrial Relations Department
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Major Single-Program Laboratories

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Subject Contents

The subject content of *DOE New Technology* is arranged as shown below. The two-digit category numbers printed here illustrate the category number assignment used in the database records.* The following list includes all of the 38 first-level categories. There are 313 second-level categories not shown here. Because each issue of *DOE New Technology* publishes citations only for those documents announced since the last publication, some subject categories may not be present in every issue.

Numerical Listing of Categories

Alphabetical Listing of Categories

*The numerical subject category scheme is used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's data systems. Categories and definitions for the complete set of six-digit numbers are given in ETDE/PUB--1-R2, *International Energy: Subject Categories and Scope*.

How To Read a Citation

Following are samples of citations and abstracts, one from Section I and one from Sections II and III. The principal data elements included in each of these samples are shown in the listings with corresponding numbers in the samples.

Sample citation and abstract from Section I.

1. Abstract number → 5 ORTA-PETC-00005
2. Report number → **Chemical Coal Cleaning**
3. Title → ***DOWNEY, K.R.***
4. Technology transfer contact → *Pittsburgh Energy Technology Center, Box 10940,*
5. Address → *Pittsburgh, PA 15236*
6. Telephone number → *(412) 892-6029*
7. Abstract → Upon combustion of coal, sulfur found in the coal forms sulfur dioxide, which in combination with atmospheric moisture can form sulfuric acid, a component of acid rain. The current approach to this problem is to scrub the flue gas. One alternative to cleaning flue gas is . . . .

Sample citation and abstract from Sections II and III.

1. Abstract number → 72 **Bacterio-electric leaching of metals.** Lazaroff, N.;
2. Title →
3. Author(s). First 10 names in the data record are printed, then "et al." is listed. → Dugan, P.R. To Dept. of Energy. 27 Feb 1990 USA Patent
4. Patent assignee →
5. Published date → Application 7-486,039. 25p. Sponsored by USDOE,
6. Patent application number →
7. Number of pages or page range → Washington, DC (USA). DOE Contract AC07-76ID01570.
8. Contract or grant number → Order Number DE91011689. Source: OSTI; NTIS; GPO
9. Order number. The "DE" prefix order number may be used for ordering at NTIS or OSTI, as appropriate. The "TI" prefix order number is valid only at OSTI. → Dep.
10. Sources of availability from which a copy of document may be obtained; usually appear as abbreviations. (See information below.)
11. Abstract → The present invention relates to the biological beneficiation of an ore body or fossil fuel utilizing an applied electrical field in conjunction with living microorganisms and/or their metabolic by-products to effect the release of metallic ions or mineral components from the ore body. 8 figs. 2 tabs.

To Obtain a Report

Sources are listed normally as abbreviations shown below. The corresponding addresses are provided at right from which documents with these abbreviations may be ordered. When "OSTI" is given **DOE and DOE contractors may order these documents from OSTI.** (However, check with your library or information organization which may require that orders go through them to OSTI.) Prices are normally based on total pages unless special pricing applies. The order numbers provide quicker access for report ordering and should be used where possible.

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Office of Scientific and Technical Information
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GPO Superintendent of Documents
Government Printing Office
Washington, DC 20402

GPO Dep. Available for inspection or interlibrary loan at
Government Printing Office
regional depository libraries.

NTIS U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road,
Springfield, VA 22161

Contents

Section I
New Technology from DOE

01 COAL, LIGNITE, AND PEAT

Oak Ridge National Laboratory

1. ORTA-ORNL-00423
Biotechnology and Coal Processing
PROSSER, G.A.
Office of Technology Transfer, Martin Marietta Energy Systems, Inc., FEDC, P.O. Box 2009, Oak Ridge, TN 37831
(615)574-4552

Coal is the most abundant fossil resource in the United States. It is the potential starting material for a wide range of organic chemicals and a promising alternative fuel source to the diminishing supplies of petroleum and natural gas. Because the environmental impacts of conventional coal-conversion processes and coal combustion may be severe, advanced coal-processing systems are needed for the safe and efficient use of this resource. Biotechnology has been envisioned as the basis for some advanced coal-processing systems. The bioprocessing of coal, in which coal is gently and effectively altered by bacteria, fungi, or their enzymes, represents an attractive alternative to the severe operating conditions and the potential environmental impact of thermal/chemical coal-conversion processes. Bioprocessing could also be used to remove harmful pollutants from fuel coal before it is burned. Specifically, some microorganisms or active fractions of organisms can interact with specific heteroatoms in both liquid and solid states to cleave or alter chemical bonds. These unique properties may be exploited in a number of ways: (1) the pretreatment of coal to form a reactive surface or to remove sulfur, nitrogen, oxygen, or heavy metals; (2) the conversion of coal to gaseous or liquid products; and (3) the isolation or removal of hazardous materials from various coal-processing effluents. The Oak Ridge National Laboratory (ORNL) report, *Impact of Biotechnology on Coal Processing*, contains a summary of the extent to which biotechnology has been applied to a wide range of coal-processing problems. Very little research has led to the practical application of coal bioprocessing. A better understanding of these biological processes and the ultimate development of viable bioprocessing systems are still needed to reap the potential benefits of biotechnology for the coal industries.

05 NUCLEAR FUELS

Oak Ridge Institute for Science and Education

2. ORTA-ORISE-00036
Transportation of Radioactive Materials Q & A about Incident Response
LOGES, M.M.
Office of General Counsel, Oak Ridge Institute for Science and Education, P.O. Box 117, Oak Ridge, TN 37831-0117
(615)576-3756

This document contains concise answers to potential questions of responders to accidents involving radioactive materials. The questions include how to use radiation detection equipment, how to work safely around contamination, what the signs and placards used for shipment of radioactive materials indicate, and what the guidelines are for emergency medical management.

Oak Ridge National Laboratory

3. ORTA-ORNL-00412
Miniature Pan-and-Tilt Mechanism
PROSSER, G.A.
Office of Technology Transfer, Martin Marietta Energy Systems, Inc., FEDC, P.O. Box 2009, Oak Ridge, TN 37831
(615)574-4552

A compact, lightweight, high-torque pan-and-tilt mechanism has been developed by researchers in the Robotics and Process Systems Division of Oak Ridge National Laboratory (ORNL). It is used to position the closed-circuit television cameras attached to ORNL's Advanced Servomanipulator (ASM). Because the ASM was developed for repair work in hostile environments, this new device is corrosion-resistant and hardened against radiation. Although it is only about half the size and, at 11 1/4 lb, half the weight of conventional pan-and-tilt mechanisms, it can deliver the same amount of torque. The two-piece housing design allows ease of assembly and disassembly. An aluminum housing and small, high-strength stainless steel gears are used to keep the unit as lightweight as possible and to provide stability in radioactive and corrosive environments. The mechanism is constructed around a motor-driven gear differential that has two degrees of freedom. The pan axis is through the axis of the two large bevel gears. The tilt axis intersects the pan axis

at a 90° angle. The maximum angular travel is ±90° for panning and is continuous for tilt (or vice versa, depending on the orientation of the mechanism). On-board potentiometers provide encoding for accurate positioning of the camera. The two high-torque gear-reduction drive motors are enclosed within the housing. These motors drive the large bevel gears of the differential independently. The gears are supported on bearings that fit into holes in the side walls of the housing. The unit used on the ASM is powered by two 24-V dc permanent-magnet motors, providing 150 in.-lb of torque and rotational speeds between 1 and 20°/s as measured at the pan and tilt axes. These motors can easily be interchanged with others that allow for various output torques and speeds. This device would be the mechanism of choice for both government and private industry any time space is limited, weight is to be reduced, and the environment is hostile.

10 SYNTHETIC FUELS

Lawrence Berkeley Laboratory

4. ORTA-LBL-00262
Methane Conversion Process
FRAGIADAKIS, C.
Technology Transfer Office, Lawrence Berkeley Laboratory, 1 Cyclotron Road, Berkeley, CA 94720
(510)486-7020

Lawrence Berkeley Laboratory (LBL) scientists have identified catalysts and operating conditions that can convert methane—the primary ingredient of natural gas—to ethylene, propylene, and other valuable hydrocarbons without the production of unwanted carbon dioxide. Market products are clean-burning gasoline and petrochemicals used to manufacture plastics, solvents, synthetic fibers, and drugs.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

Lawrence Berkeley Laboratory

5. ORTA-LBL-00275
Thermally Improved Compact Fluorescent Fixture
FRAGIADAKIS, C.
Technology Transfer Office, Lawrence Berkeley Laboratory, 1 Cyclotron Road, Berkeley, CA 94720
(510)486-7020

The new compact fixture assembly virtually eliminates thermally induced heat loss that results from a fixture's constricted thermal condition, and allows the lamp's lumen output and system efficacy to remain near optimum. Lawrence Berkeley Laboratory's (LBL's) new fixture enables a 13-watt compact fluorescent lamp to replace a 60–75-watt incandescent lamp without loss of light.

6. ORTA-LBL-00276
Inexpensive Illumination Improvement
FRAGIADAKIS, C.
Technology Transfer Office, Lawrence Berkeley Laboratory, 1 Cyclotron Road, Berkeley, CA 94720
(510)486-7020

Lawrence Berkeley Laboratory (LBL) researchers have developed a low-cost system for spot cooling fluorescent lamps inside fixtures which will maximize efficiency, increase light output by 15–20%, and save energy. Made of a thermally conductive liquid enclosed in a thin flexible membrane, the system forms a small conformable thermal bridge between the top of the lamp and the shell of the fixture.

7. ORTA-LBL-00287
Gas-Filled Insulating Panels
FRAGIADAKIS, C.
Technology Transfer Office, Lawrence Berkeley Laboratory, 1 Cyclotron Road, Berkeley, CA 94720
(510)486-7020

A non-chlorofluorocarbon (CFC) high-performance insulation for buildings and appliances has been developed at Lawrence Berkeley Laboratory (LBL). Gas-filled panels are a new, advanced approach to ambient temperature–thermal insulation applications. The technology is simple and has been commercially successful in thermally insulating windows. The panels consist of infrared reflecting (low emissivity) multilayer baffles enveloped by a sealed barrier and filled with low-conductivity gas or air (at atmospheric pressure).

33 ADVANCED PROPULSION SYSTEMS

Lawrence Berkeley Laboratory

8. ORTA-LBL-00254
Zinc–Air Battery
FRAGIADAKIS, C.
Technology Transfer Office, Lawrence Berkeley Laboratory, 1 Cyclotron Road, Berkeley, CA 94720
(510)486-7020

Lawrence Berkeley Laboratory (LBL) has devised a new electrochemical cell that shows promise of exceeding performance targets set by the Department of Energy for battery power and energy density in electric vehicles. An important feature of the cell is that one of the electrodes (zinc anode) is

particulate. The battery is "mechanically" rechargeable; no time is wasted on conventional electrical charging.

9. ORTA-LBL-00255
Zinc–Nickel Oxide Battery
FRAGIADAKIS, C.
Technology Transfer Office, Lawrence Berkeley Laboratory, 1 Cyclotron Road, Berkeley, CA 94720
(510)486-7020

The rechargeable alkaline zinc–nickel oxide battery has high specific energy, twice that of conventional lead–acid batteries, and high specific power. The battery is maintenance-free and environmentally benign. Lawrence Berkeley Laboratory (LBL) has discovered electrolyte additives that greatly extend the cycle life of this battery, yielding a very promising candidate for near-term application in electric vehicles.

36 MATERIALS

Ames Laboratory

10. ORTA-AMES-00131
Superconducting Wire Offers Increased Flexibility
WILLIAMS, D.E.
Office of Research and Technology Application, Ames Laboratory, 119 Office and Laboratory, Iowa State University, Ames, Iowa 50011
(515)294-2635

Researchers have helped develop a superconducting wire that is five times more flexible than other wire. The goal of the work is to fabricate a strain-tolerant conductor that can be used in magnetic wire or in high T_c superconducting wire needed for interconnects in electronic circuits. The development work consisted of two parts: (1) forming the superconducting starting material into fiber and (2) forming the fiber into wire. Ames researchers realized that technology for making furnace insulation fibers might be adapted to making superconducting fibers. The technique involves melting the superconducting raw material and flowing a liquid stream of it into a supersonic nozzle where a gas jet shapes and freezes the material into long slender fibers. To be successful, the material must melt and freeze in much the same way that melted glass is blown into strings. This technique works best with $Bi_2Sr_2CaCu_2O_8$ superconducting material because the viscosity changes slowly over a wide temperature range, allowing the time needed to pull the material into a fiber. After drawing, the fibers are coated with silver and pressed together and heated to make them superconductive. By distributing the silver properly, a 1-mm-diameter wire can be bent around a 2-cm-diameter rod without breaking. Under strain, it can carry 1000/amps/cm^2 of current at .75% at 20 T and 4.2 K. The wire is a promising material for linking superconducting devices that exist on separate chips in magnetometers (research instruments that measure the magnetic moment of a sample). For such an application, the important criteria is high flexibility; the amount of current carried is less important. Researchers and scientists are pursuing a new idea that may enable them to make a wire that will carry higher electrical current.

Patent application filed.

11. ORTA-AMES-00123
Powders Hold Promise for Capturing Market Share: Modified High-Pressure Gas Atomization
WILLIAMS, D.E.
Office of Research and Technology Application, Ames Laboratory, 119 Office and Laboratory, Iowa State University, Ames, Iowa 50011
(515)294-2635

Ames Laboratory metallurgists have invented a more efficient, cost-effective, and safe way to produce powders of neodymium–iron–boron alloys, meriting a 1991 R & D-100 Award. The inventors also received a 1991 FLC Award for Excellence in Technology Transfer. The powders are used to make super-powerful Nd–Fe–B permanent magnets that command a high-volume consumer market forecast to reach $2.7 billion by the year 2000. The market is being driven by the need for smaller and more powerful magnet components in motors and generators, acoustical devices, computer and communications equipment, and everyday items. Although Nd–Fe–B magnets are 10 to 40 times stronger than competing ferrite magnets, technological barriers in powder processing have prevented U.S. magnet producers from capturing more of the Nd–Fe–B market. Current powder-making methods must contend with explosion hazards, contamination, microstructural inhomogeneities, and long processing times, all of which lower cost effectiveness. The process is based on high-pressure gas atomization, using a unique supersonic nozzle to blast a falling stream of molten metal with very cold argon gas traveling up to three times the speed of sound. Extremely fine, homogeneous, spherical droplets are formed and cool rapidly as they fall to a collection point. They are frozen in a microstructure of nanometer scale, which imparts optimum isotropic magnetic properties to the material. Thus powder is directly produced from alloy, an improvement over existing methods that require separate melting and chopping/grinding steps to produce powder. Another key feature of the process is a protective coating step that makes the magnetic material less explosive, less subject to contamination, and 40 times more resistant to environmental attack and corrosion than other powders. The powders are especially well suited to fill the market niche for polymer-bonded magnets; the small, spherical particle size allows more "packing" into a polymer, resulting in a stronger magnet.

Patent issued.

12. ORTA-AMES-00127
Sounding Out Defects
WILLIAMS, D.E.
Office of Research and Technology Application, Ames Laboratory, 119 Office and Laboratory, Iowa State University, Ames, Iowa 50011
(515)294-2635

The goal of the basic research in this project was to develop ultrasonic methods that could be used to detect flaws in steel

nondestructively and evaluate and characterize materials. Development work on the inspection system was conducted at the Iowa State University Center for Nondestructive Evaluation (CNDE). The system completed by CNDE features several capabilities that distinguish it from other inspection systems. It uses acoustic holography to image the flaw and incorporates certain algorithms that provide more accurate estimates about the size and location of defects. It also includes a new software program for rating the quality of the material analyzed. This is a unique capability that permits testing of larger amounts of material, resulting in better statistical reliability. The inspection system is not patented but is being combined with other NDE instrumentation technologies as a possible licensing package. CNDE researchers are also investigating other hardware and software technologies that could be incorporated into a second-generation system.

Idaho National Engineering Laboratory

13. ORTA-INEL-00154
Oxynitride Glass Production Procedure
HOLMAN, R.D.
Manager, ORTA, EG & G Idaho, Inc., P.O. Box 1625, Idaho Falls, ID 83415-3561
(208)526-8318

This invention relates to a new and improved method for preparing oxynitride glasses that do not need the high temperatures and high pressures required by prior art methods of preparing these glasses. Nitrogen-containing compounds such as Si_3N_4 are first encapsulated in a low-melting-temperature glass. Particles of the encapsulated nitrogen-containing compound are mixed with other oxide glass formers and melted in an atmosphere of flowing nitrogen and in the presence of buffering gas to form the oxynitride glass. Glasses containing up to 15 at. % nitrogen have been prepared by this method.

U.S. Patent No. 5,006,142.

Lawrence Berkeley Laboratory

14. ORTA-LBL-00256
Fabrication of Anisotropic Membranes
FRAGIADAKIS, C.
Technology Transfer Office, Lawrence Berkeley Laboratory, 1 Cyclotron Road, Berkeley, CA 94720
(510)486-7020

Microporous anisotropic polymer membranes have been fabricated using a new, cost-effective process. A unique thermal-inversion process allows formulation of membrane pore size, pore distribution, and chemical composition. The performance of these open cell membranes, consistently produced to predetermined specifications, is unequaled by those presently available.

15. ORTA-LBL-00277
Controlled Growth of Semiconductor Crystals
FRAGIADAKIS, C.
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This easy-to-use process, a liquid encapsulated, vertical gradient-freeze technique, prevents random nucleation and sticking during the growth of gallium arsenide single crystals in pyrolytic boron nitride crucibles. The process produces low dislocation densities and allows control of crystal diameter.

16. ORTA-LBL-00283
Self-Assembled Molecular Films
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An apparatus and process has been created for the ordered assembly or polymerization of molecular films from functionalized monomers. These materials could be used to detect molecular recognition events at a molecular interface, also as new coatings for lithography, and for semiconductor materials. The monomers are a combination of a ligand, a linker, a polymerizable group (optional), and a surface attachment group.

17. ORTA-LBL-00285
Superconducting Multilayer Interconnect Technology
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Fabrication of complex devices using high-temperature superconductors is now possible. Lawrence Berkeley Laboratory (LBL) researchers are able to fabricate multilayer interconnects and multiturn flux transformers for use with dc superconducting quantum interference devices (SQUIDs). During tests, the devices performed well at temperatures as high as 86 K (– 187 °C).

18. ORTA-LBL-00286
Electrochromic Optical Switching Device
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This invention is made of electrically conductive films, electrochromic film, and a reversibly polymeric electrolyte to make an optical switching device for a variety of applications. The device consists of five layers. The electrochromic film is switched from transparency to opacity by controlled

ion movement caused by minor changes in electrical current. Applications include energy-saving windows, eyeglasses, watches, and computer display screens.

19. ORTA-LBL-00289
Mini Pulsed Metal Plasma Gun
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This invention consists of a radically new device and method to deposit thin metal films, including multilayer, multimetal thin films. Unlike current methods, this technology offers simplicity, cleanliness, and compatibility with a wide range of metals that are otherwise difficult to form into thin films. The device is very small and offers benefits in terms of operational flexibility.

Oak Ridge National Laboratory

20. ORTA-ORNL-00415
Self-Aligning Axial/Torsional Loading Mechanism for Testing Brittle Materials
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Structural uses are being found for ceramics and brittle materials such as carbon–carbon composites. The usefulness of these materials is limited by their ability to withstand stress. Most efforts to determine the structural properties of ceramics and composites have focused on discrete compressive, tensile, and torsional testing. Existing equipment cannot be adjusted to accommodate combined axial and torsional evaluations. Researchers at Oak Ridge National Laboratory (ORNL) are developing a self-aligning loading mechanism that will allow for the characterization of any material sensitive to misalignment during combined axial–torsional testing. This ball-and-socket device is composed of a hydrostatic frictionless bearing attached to a threaded stud. The bearing is stabilized against torsional motion with a flexure ring positioned normal to the stud and attached to the housing and the ball. This ring imparts a negligible spring constant but creates no friction. Used in pairs, these assemblies can be mounted on standard test equipment, with a test specimen secured between them by means of couplings mounted on the studs. The bearings are positioned opposite each other and are roughly aligned by conventional means. Because the bearing flexes, it delivers the test force correctly, without imposing an unwanted bending moment on the test piece. Imposed tensional or torsional pressure forces are transmitted through the centerline of the stud. The size of the device can be varied to provide for different loading requirements. The pressure at the recesses of the housing should be about half the supply pressure so that the mechanism is most responsive to fluctuating loads during a test. The pressure at each recess in the housing may be measured and controlled to fine-tune the bearing. The prototype is designed to withstand an internal pressure of 10,000 psi: the ball stud is designed for a maximum axial load of 50,000 lb and a combined torsional load of 25,000 in.-lb.

21. ORTA-ORNL-00427
Improved Process for Preparing Transition-Metal Nitride Whiskers
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Titanium nitride is a promising material for commercial use because of its hardness, high melting point, high electrical conductance, and stability at high temperatures in inert atmospheres. Titanium nitride can be produced in the form of "whiskers", which are single crystals having desirable properties for industrial applications. For example, the whiskers may be used to reinforce advanced ceramics by mixing them with the appropriate compatible powders (such as silicon carbide or silicon nitride). The mixtures can then be molded and sintered to make composites in the form of monoliths or complicated parts. A new process for preparing high-quality titanium nitride whiskers has been developed at Oak Ridge National Laboratory (ORNL). This process produces a high yield and requires relatively inexpensive and easily available starting materials. The only previously known methods are based on high-temperature gas-phase reactions that produce low yields and require careful handling of both the reactant gases and the hydrochloric acid byproduct. The new method should be efficient and economically feasible for commercial use. It involves reacting easily obtained materials (sodium titanate powder and sodium cyanide powder) at about 1000°C. The whiskers produced by this method have an aspect ratio between 30 and 50 (50 to 2500 μm long and 0.1 to 5 μm diam). The length of the whiskers can be governed by controlling the ratio of the reactants or by partial or complete substitution of potassium cyanide for sodium cyanide.

22. ORTA-ORNL-00431
Chemical Vapor Deposition in the Silicon–Carbon and Boron–Carbon–Nitrogen Systems
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Chemical vapor deposition (CVD) is being studied to develop both suitable coatings and the techniques needed to apply them. This research effort was divided into two related areas. First, the fundamental rate-limiting processes in the deposition of SiC coatings were studied. Second, two-phase B_4C–BN was investigated as a potential wear coating. Several techniques were combined to establish the rate-limiting processes for the deposition of SiC, including equilibrium analysis, mass spectrometric measurements of gas-phase species, analysis of kinetic data, and thermokinetic assessment. The equilibrium analysis, carried out with a custom

computer code (SOLGASMIX-PV), analyzed methyltrichlorosilane (MTS) diluted with either hydrogen or an inert gas. MTS was determined to be a relatively unstable species that would readily decompose into $SiCl_4$ and CH_4. Single-phase SiC would form under all the conditions explored; HCl would be the product gas. Continuous measurement of the reactant gases corroborated the computer analysis. The CVD reactants that reached the substrate surface were $SiCl_4$ and CH_4; these reactants are likely to be important in discerning the rate-limiting mechanisms. Comparisons between kinetic data for the CVD MTS system with data from previous research indicated that deposition of SiC from MTS in the presence of hydrogen was limited by adsorption or surface diffusion. Therefore, elucidation of its processes depends on further in situ analysis. Deposition of SiC from MTS diluted with an inert gas was limited by a unimolecular surface or gas-phase reaction, so it was possible to identify four likely rate-limiting reactions using thermokinetic analysis based on tabulated thermodynamic data. Two-phase B_4C–BN was investigated because it offered good protection against oxidation, corrosion, wear, and erosion.

23. ORTA-ORNL-00425
Gasless Metal Atomization and Spray-Forming Nozzle
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Thermal spraying is widely used to produce metal powders and to apply protective coatings. In the conventional thermal-spraying process, molten metal feedstock is propelled and atomized by a high-velocity stream of inert gas. This process is noisy and cumbersome and must satisfy stringent environmental requirements. The inert gases are expensive, and their use eliminates the possibility of high-vacuum operation. Also, these gases dissolve in the metal, thus reducing the quality of the finished product. A unique nozzle recently developed at Oak Ridge National Laboratory (ORNL) does not require an inert-gas propellant; the spray is propelled by magnetohydrodynamic forces. This device is cheaper, quieter, simpler, and more versatile than gas-fed nozzles. It can operate in air, inert gas, or a vacuum. Molten metal is fed into a gap between two electrodes, which are located between the faces of a dc electromagnet. This setup generates a very large force that atomizes and accelerates the molten metal. The new nozzle can produce powders or can deposit metal onto a substrate to form a protective coating or to produce high-purity sheets, plates, and near-net shapes. Because this process uses no gas for atomization, the liquid droplets can be cooled at a controlled rate to produce a range of microstructures with distinct mechanical properties. This method also produces powders of higher purity than are available commercially. The irregularly shaped particles that compose these powders are by far superior to conventional spherical particles for cold compaction into dense shapes; unlike commercial powders, they contain no dissolved inert gases to expand and leave pores during consolidation processes. Because this device can operate in reduced-pressure and high-vacuum environments, it is uniquely suited for use with highly reactive metals (such as titanium, niobium, and tantalum) and their alloys.

24. ORTA-ORNL-00433
Magnetohydrodynamic Device for Purifying Molten Metals
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High-performance metal components and near-net-shape castings need to be as free of defects as possible. Nonmetallic inclusions are defects of particular concern because cracks originate from them. Ceramic filters are valuable for small-scale use in foundries or in the special-metals industry but are too expensive, inefficient, and unreliable for large-scale applications. Ceramic filters are fragile and cannot be recycled; they clog quickly and cannot be adapted easily to current industry practices. A magnetohydrodynamic (MHD) device being developed at Oak Ridge National Laboratory (ORNL) will provide an inexpensive, efficient, and reliable method for removal of nonmetallic impurities from a variety of molten metals and alloys. An ac electromagnet is used to induce an alternating current in a flowing stream of liquid metal. The metal is confined within a specially designed chamber placed between the faces of the electromagnet. As the metal flows through the chamber, it is acted upon by MHD forces created by the crossing of the magnetic field with the current induced in the metal. This force, known as the Lorentz force, always occurs at right angles to the plane that contains the current and magnetic field vectors. Although the magnitude of the force varies, at any given position in the flowing metal the force is always unidirectional. This phenomenon can be thought of as a body force on the liquid, always directed toward the centerline of the flowing stream, and as an apparent density increase within the liquid. The nonconducting or poorly conducting inclusions are unaffected or minimally affected by the MHD forces. This results in very large buoyancy forces on the impurity particles as they are surrounded by a very-high-density fluid. The particles then float toward the outside of the stream where they can be either absorbed on the chamber walls or diverted into a slag layer above the casting.

U.S. Patent No. 4,786,320.

40 CHEMISTRY

Lawrence Berkeley Laboratory

25. ORTA-LBL-00618
Carboxylic Acid Update
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Another process has been developed for the recovery of low-volatility carboxylic acids from aqueous solutions at pH at or above the pKa of the acid. The process utilizes a strongly basic sorbent or extractant and achieves 100% regeneration of the extractant/sorbent without consuming chemicals or generating a waste salt stream.

26. ORTA-LBL-00265
Tritium Labeling Method
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Lawrence Berkeley Laboratory's (LBL's) new "one pot" method allows the site-specific incorporation of tritium into organic and biological molecules by efficient reduction processes. The inventors expect the new tritide reagents will create a completely new area of tritium labeling with a market size similar to those serviced by the current techniques of tritiation and tritiodehalogenation.

27. ORTA-LBL-00284
Carbohydrate–Monomer Synthesis
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A simple, one-step method has been developed that induces naturally occuring enzymes to modify a wide variety of synthetic, acrylic-type monomers. This innovative technique is rapid, cost-effective, and versatile. The enzymes catalyze the previously difficult attachment of carbohydrates to acrylic-type monomers. New polyacrylates formed from these novel monomers exhibit intriguing biocompatible properties, such as increased water content.

Oak Ridge National Laboratory

28. ORTA-ORNL-00417
A Ternary Nitrate Solution for Absorption Heat Pump Working Fluids
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An aqueous ternary mixture is available for high-temperature heat pump applications. This solution (53 wt % $LiNO_3$, 28 wt % KNO_3, and 19 wt % $NaNO_3$) has been developed as a working fluid for absorption heat pumps. It has the potential for producing higher coefficients of performance (COPs) than conventional lithium bromide (LiBr) solutions although the limits of applicability of the two fluids are different. A common region exists where useful comparisons can be made, and research has begun at Oak Ridge National Laboratory (ORNL) to determine the advantages and limitations of ternary nitrate mixtures. A computer study was carried out to compare the potential performance of the ternary nitrate solution with that of LiBr in a temperature-amplifier heat pump for high-temperature applications. Pressure–composition–temperature data and specific enthalpy–concentration–temperature data in the form of correlated polynomial expressions were used to simulate results of a heat pump with the respective solutions as working fluids. Results of the study indicate that the ternary nitrate mixture potentially has about a 10% advantage in COP and a 15% advantage in temperature lifts over aqueous LiBr at high temperatures. Several materials were tested for corrosion resistance in the presence of high-temperature ternary nitrate mixtures at 170 to 260°C. The corrosion study showed that A106B carbon steel and 304L stainless steel can be recommended as structural materials for vessels and piping over the entire temperature range. These materials are resistant to stress–corrosion cracking under deformation when subjected to very aggressive test conditions. They also have low corrosion rates (<1 M/year) when exposed to static ternary nitrate mixtures at temperatures up to 260° C. More testing is needed to determine corrosion rates and system performance under actual working conditions.

42 ENGINEERING

Ames Laboratory

29. ORTA-AMES-00129
Mobile Analysis Laboratory Will Survey Waste Sites
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Researchers at Ames Laboratory and Iowa State University (ISU) have developed and assembled a prototype of a new mobile laboratory that will sample and analyze contaminated soils at a hazardous waste site by remote control. The system, which was demonstrated at DOE's Fernald, Ohio site in September 1992, should make environmental cleanup operations substantially better, faster, safer, and cheaper. A 1992 report estimated that the new system offers a 75% cost savings when compared to conventional techniques. The system gathers samples through a probe mounted on the end of a robotic arm and then automatically processes samples through a real-time, ultra-trace, multi-element analysis system. The entire laboratory is contained in a fifth-wheel trailer, which can be used to move it around a waste site. It features a computer control system, spectrometer, laser, electrical power generator, decontamination equipment, as well as a work area and storage space. Scientists in the laboratory can use the video camera and the robot arm to guide the probe to a surface sampling area. The probe will seal off the sampling area, ablate a small sample with a laser beam, and pump the vaporized sample back to the robotic sampling accessory's inductively coupled plasma torch through pressurized argon gas lines. The sample is excited in the plasma torch, and its emissions are transmitted to the spectrometer on the trailer, analyzed, and the results recorded. On-site analysis makes it unnecessary for workers to transport hazardous materials to an off-site laboratory, an advantage that also substantially reduces costs and risks. Any of this material that is not broken down by the plasma torch, is trapped in an air filtering system. Finally, the new system offers improved data on contaminants, which will help scientists tailor cleanup techniques to the needs of a site and test the effectiveness of those techniques afterwards.

Idaho National Engineering Laboratory

30. ORTA-INEL-00158
Plasma Centrifugal Furnace
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Some wastes require extremely high temperature treatment with low offgas volumes. The plasma centrifugal furnace uses an omnivorous process that will destroy virtually all organics and melt remaining inorganics into a nonleachable, homogeneous slag.

31. ORTA-INEL-00150
Built-In Test by Signature Inspection (BITSI)
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This technology will automatically troubleshoot a digital circuit by applying a test stimulus to a circuit and analyzing the response. If the response is abnormal, the system will isolate the associated fault. The offending component can then be replaced and the system returned to service without the usual diagnostic problems.

U.S. Patent No. 5,051,996.

Lawrence Berkeley Laboratory

32. ORTA-LBL-00273
Exhaust Hood Airvest
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Exhaust hoods are widely used in industry to protect workers from fumes and aerosols that are generated during a process operation. A problem with exhaust hoods is that a back-eddy develops in front of the worker that draws some of the harmful material from the process area toward the face of the worker, reducing the hood's performance. Lawrence Berkeley Laboratory (LBL) has developed an "airvest" that significantly increases the effectiveness of pollutant removal and transport. Pollutant concentration is cut by factors of 100 to 800 while reducing the electricity consumption of the exhaust hood.

33. ORTA-LBL-00274
Improved Combustion Engine
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This improvement on the combustion engine distributes fuel in a turbulent flame front. Instead of advancing in a thin spherical front that leaves unburned fuel, the Oppenheim engine creates a turbulent flame front that burns the gas more instantaneously and more cleanly. This combustion control technique is an entirely new approach to combat pollutant production in auto engines. The technology is suitable for

two-stroke and four-stroke engines, as well as Otto and diesel designs.

34. ORTA-LBL-00279
Holographic Projection X-ray Lithography
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Lawrence Berkeley Laboratory (LBL) has developed an elegant new approach to make masks for the semiconductor industry. A computer-generated hologram is used "in-line" to project the desired image onto a wafer. The hologram is the sole optic component and replaces conventional mask and projection optics. An advantage of LBL's new system for microcircuit fabrication is its relative immunity to contamination. Other advantages include high resolution, process latitude, good depth of focus, defect tolerance, and high wafer throughput.

35. ORTA-LBL-00281
Silicon Gettering Technique
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Unwanted defects, called "stacking faults", which plague semiconductor processing, can be eliminated or minimized. Gettering, or entrapping, minimizes or eliminates this processing problem that is detrimental to performance and increases the manufacturing price of integrated circuits formed on silicon. The technique is simple, compatible with existing silicon processing technology, inexpensive, and greatly improves performance and production efficiency.

Oak Ridge National Laboratory

36. ORTA-ORNL-00410
Transmission Polarizer for Neutron Beams
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A highly efficient transmission polarizer for short-wavelength neutrons has been developed at Oak Ridge National Laboratory (ORNL). For the first time, highly polarized beams can be produced efficiently from the 2.5-Å neutrons that are abundant in a normal reactor spectrum. This device also opens up the field of polarization analysis in small-angle scattering, making possible a wide variety of experiments on magnetic and hydrogen-containing materials such as superconductors, polymers, and biological materials. Furthermore, the mathematical techniques used in developing this polarizer are applicable to optical devices for all types of radiation. The transmission polarizer, analogous to a multilayer broad-band optical filter, is composed of a stack of supermirrors. Supermirrors are made by applying thin layers of reflective magnetic material to thicker layers of single-crystal silicon, which are nearly transparent to neutrons. The proper layer thicknesses of an iron alloy and aluminum that give excellent polarization and reflectivity have been found. A stack of supermirrors made by standard commercial sputtering techniques was assembled to produce a polarizer about 6.5 cm long and 3.7 cm thick; it produces a beam size of about 6.5 × 3 cm. The polarizer is highly efficient, and can be used with a standard neutron scattering spectrometer. Neutrons of either spin state can be analyzed with the refracted or the undeviated beam. This device has been applied successfully (both to polarize the incident beam and to analyze the polarization) in tests to understand the structure and behavior of superconducting materials.

44 INSTRUMENTATION

Ames Laboratory

37. ORTA-AMES-00120
New Analytical Technique Enhances Biological Studies: Microfluor Detector
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A new device based on laser-excited fluorescence provides unparalleled detection of biological materials for which only limited sample sizes may be available. This device, invented at the Ames Laboratory, also received a 1991 R & D-100 Award. The need for improved detection techniques is being driven by important studies of the human genome, abuse substances, toxins, DNA adduct formation, and amino acids, all of which may be difficult to study because of the limited sample amounts available. Although powerful and efficient methods such as capillary electrophoresis have been developed for separating biological mixtures in small volumes, equally powerful techniques for subsequent detection and identification have been lacking. The Ames Microfluor detector meets this need, combining the capability to analyze very small volumes with very high sensitivities. The underlying principle of the instrument design uses the fact that drugs and many important biomaterials are fluorescent, and many other biomaterials such as peptides and oligonucleotides can be made to fluoresce by adding a fluorescent tag. When a sample-filled capillary tube is inserted into the Microfluor detector and is irradiated by a laser beam, the sample will fluoresce. The detector detects, monitors, and quantifies the contents by sensing the intensity of the fluorescent light emitted. The signal is proportional to the concentration of the material. The proportionality constant is characteristic of the material itself. Analyses can be performed with sample sizes 50 times smaller than those required by other methods, and concentrations as low as 10^{-10} M can be measured. These two features make the Microfluor detector uniquely compatible with capillary electrophoresis. In addition, the detector is distinct from other laser-excited

detectors in that it is not seriously affected by stray light, and it allows simple alignment and operation in full room light.

U.S. Patent No. 5,006,210.

Brookhaven National Laboratory

38. ORTA-BNL-00127
Wavefront Dividing Infrared Interferometer
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Researchers at Brookhaven National Laboratory have developed an instrument that opens up a class of experiments with synchrotron radiation. Known as a wavefront dividing infrared interferometer, the instrument is installed at Brookhaven's National Synchrotron Light Source (NSLS). An interferometer splits light from a source into two beams, one of which then passes through a sample. When the beams are recombined, an interference pattern results, thereby giving information about the sample. At the NSLS, the BNL interferometer is coupled to the new infrared beam line, which is the brightest broadband infrared source available today. As a point of reference, the infrared beam line produces radiation that is over 300 times hotter than the surface of the sun. This extreme intensity enables the interferometer to perform efficiently in the spectral region from the mid-infrared to millimeter wavelengths. In the past, this particular region has been difficult to work in because it is an area of low photon energy and, hence, weak signals. The BNL interferometer has a signal-to-noise ratio as much as 1000 times better than that of conventional instruments. As such, it can measure highly absorbing samples such as high-temperature superconductors. The interferometer can also detect small signals from dilute systems, such as molecules on metal surfaces, which makes possible catalysis and corrosion studies at the molecular level. Further, the spectral region covered by the instrument is of great interest to the chemical, oil, and gas industries, particularly for research on environmental control and monitoring. When measuring a sample, the BNL interferometer covers, in a single scan, a wavelength region from 10 μm to 1 cm. The instrument can operate with no change in components, a significant advantage over conventional instruments. In addition, it can completely characterize the optical activity of solids, liquids, and gases.

Idaho National Engineering Laboratory

39. ORTA-INEL-00156
Spatial Optic Multiplexer/Diplexer
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The spatial optic multiplexer/diplexer is an apparatus for simultaneous transmission of optic signals having different wavelengths over a single optic fiber. Multiple light signals are transmitted through optic fibers formed into a circumference surrounding a central core fiber. The multiple light signals are directed by a lens into a single receiving fiber where the light combines and is then focused into the central core fiber which transmits the light to a wavelength discriminating receiver assembly.

U.S. Patent No. 5,054,018.

40. ORTA-INEL-00152
Piezoelectric Measurement of Laser Power
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Measurement of laser power over a wide dynamic range is required in many applications. This apparatus is relatively inexpensive and compact. It is a method for measuring the energy of individual laser pulses or a series of laser pulses by reading the output of a piezoelectric (PZ) transducer that has received a known fraction of the total laser pulse beam.

U.S. Patent No. 5,048,969.

41. ORTA-INEL-00148
Pulser Injection with Subsequent Removal for Gamma-Ray Spectrometry
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The invention is an improved system for electronic pulse injection in gamma-ray spectrometers. Electronic calibration pulses, injected at the preamplifier, are identified at the analog-to-digital convertor (ADC) exit and digitally shifted to a portion of the spectrum where gamma-ray storage is prohibited. This invention provides the accurate gain and zero tracking and rate effects corrections afforded by pulse injection systems with no operator attention to pulser peak positioning. The system is readily adaptable to several commercial multichannel analyzers.

U.S. Patent No. 4,968,889.

Lawrence Berkeley Laboratory

42. ORTA-LBL-00258
Amorphous Silicon Array for Medical Imaging
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Lawrence Berkeley Laboratory (LBL) scientists are developing a new technology using amorphous silicon for detection of charged particles and X rays. The technology can be used in a variety of products. In medicine, it can provide for real-time electronic imaging of X rays, and also

serve as a detector in computerized tomography. Digitized images can be transmitted instantaneously over phone lines.

43. ORTA-LBL-00259
Gamma Radiation Detector
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The gamma radiation detector is a high-efficiency detector with high stopping power and fast time response. It uses a lead carbonate scintillator that has 10-times-faster response and rate capabilities than current detectors. Major markets for this detector are high-energy physics and medication instrumentation, specifically positron emission tomography (PET) equipment.

44. ORTA-LBL-00291
Biomass Water Filters
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Selective removal of toxic heavy metal ions from contaminated water has been accomplished by Lawrence Berkeley Laboratory (LBL) scientists using a cost-effective, reusable filter fabricated from a mixture of inert biomass and living algae. The goal of this novel approach is development of filters that target and remove toxic heavy metal anions and cations present in contaminated groundwater. LBL is seeking companies interested in collaborating on this exciting project.

Oak Ridge National Laboratory

45. ORTA-ORNL-00420
An On-Line Voltammetric Analyzer for Trace Metals in Wastewater
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Researchers at Oak Ridge National Laboratory (ORNL) have developed an on-line voltammetric wastewater analyzer (OVWA). The device brings the power of polarographic analysis to the field for relatively inexpensive, sensitive, real-time measurement of contaminants in the parts-per-billion range. It can be used to characterize wastewater streams with variable contaminant loading, analyze the control of wastewater treatment in real time, and monitor treatment-plant discharge to ensure regulatory compliance. OVWAs have been installed for trace-metals analysis at three points in the ORNL process wastewater system. They analyze the metals of concern (cadmium, chromium, copper, nickel, lead, and zinc) at the parts-per-billion level with a cycle time of 30 minutes. These systems have operated unattended for up to three days, and their results have compared favorably with the results of inductively coupled plasma spectroscopy analysis of concurrent grab samples. The analytical methods used can be adapted to determine the levels of other metals, anions, and electroactive organics. Pretreatment schemes may be necessary for the application of the OVWA to wastewater streams containing compounds that may interfere with the analyses (such as complexing agents, surfactants, and certain organics). The OVWA is a combination of custom-made and commercially available components. A single controller can operate up to four electrodes at once by means of a multiplexer. To ensure repeatable results, the entire assembly is housed in a heated, air-conditioned enclosure that maintains a constant temperature (±1°C). Current and voltage relationships between a mercury drop electrode and the sample solution are used to quantify electroactive constituents in water samples. The controller can store up to nine curves of sample data; larger amounts are stored on the personal computer.

55 BIOMEDICAL SCIENCES, BASIC STUDIES

Lawrence Berkeley Laboratory

46. ORTA-LBL-00257
Solid-State Digital X-ray Imaging
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Recent improvements in depositing scintillators on silicon (using patterned cesium iodide to collimate emitted light) have made it possible to obtain resolutions of X-ray images that surpass those obtained using conventional X-ray film-intensifying screen techniques.

47. ORTA-LBL-00290
Lung Densitometer Measures Pulmonary Edema
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A noninvasive lung density monitor that is accurate, easily portable, safe, and inexpensive is currently being developed for clinical use. Lawrence Berkeley Laboratory's (LBL's) lung densitometer could effectively augment the chest X ray, enabling safe and frequent updates on patient

conditions. It can be used at the bedside, and results are immediately available. Risk of radiation exposure is 1000 times smaller than exposure from X rays.

48. ORTA-LBL-00292
Identification of Cell Density Signal Molecule
FRAGIADAKIS, C.
Technology Transfer Office, Lawrence Berkeley Laboratory, 1 Cyclotron Road, Berkeley, CA 94720
(510)486-7020

A novel proteinaceous cell density signal (CDS) molecule has been identified that is secreted by fibroblastic cells in culture. It allows the cells to self-regulate their proliferation and the expression of differentiated functions. CDS molecules, and the antibodies that recognize them, are important for the development of diagnostics and treatments for injuries and diseases involving connective tissues, particularly tendons.

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

Oak Ridge Institute for Science and Education

49. ORTA-ORISE-00028
Radiation Protection Technician Generic Task List
LOGES, M.M.
Office of General Counsel, Oak Ridge Institute for Science and Education, P.O. Box 117, Oak Ridge, TN 37831-0117
(615)576-3756

The generic task list is based on task inventories developed by the Institute of Nuclear Power Operations (INPO) and used throughout the nuclear power industry, and by site-specific inventories used by DOE contractors. The generic task list is designed to include most of the duties performed by technicians at DOE sites; each facility will need to add site-specific duties to develop a comprehensive inventory.

57 HEALTH AND SAFETY

Oak Ridge Institute for Science and Education

50. ORTA-ORISE-00035
Checklist for Supervisors: Chemical Hazards On-the-Job Training
LOGES, M.M.
Office of General Counsel, Oak Ridge Institute for Science and Education, P.O. Box 117, Oak Ridge, TN 37831-0117
(615)576-3756

The checklist is a job aid for supervisors who are responsible for conducting job-specific training about chemical hazards. On-the-job training is a systematic method of providing workers with the job-related knowledge and skills required for their positions.

99 GENERAL AND MISCELLANEOUS

Ames Laboratory

51. ORTA-AMES-00125
SLALOM: "Gold Standard" for Benchmarking Scientific Computers
WILLIAMS, D.E.
Office of Research and Technology Application, Ames Laboratory, 119 Office and Laboratory, Iowa State University, Ames, Iowa 50011
(515)294-2635

The Scalable, Language-Independent, Ames Laboratory, One-Minute Measurement (SLALOM) is an objective means of comparing scientific computers. The program is "a timed race through obstacles"; it fixes time, rather than problem size, in making comparisons. Existing benchmark methods fix the size of the task and measure the time it takes to solve that task. Instead of using fixed distance, the SLALOM approach is "In one hour, how far can each go?" The ratio of distances traveled then provides a more fair measure of their relative performance. By using fixed-time principles, SLALOM can compare Macs and CRAYs, doing justice to both. It has no preferred computer architecture or language so it can be run on scalar, vector, and parallel machines of all kinds. SLALOM is the first benchmark to include scalable tasks, so that the size of the problem can be adjusted to match the power of the computer. This feature enables SLALOM to keep pace with hardware advances. SLALOM is designed to remain useful for many computer generations and will be able to benchmark computers 10,000-times faster than the ones used today. SLALOM is also the first benchmark that can evaluate an entire application (including setup and input/output) instead of an excerpt. Older benchmarks measure only simplified sections of applications, or use cases with very little input/output. FORTRAN, C, and Pascal definitions of the revised benchmark are available, with variants for any number of processors and various means of controlling those processors. Computers have increased in speed by a factor of perhaps a billion over the past 50 years. More dramatic advances in computer speed are likely to come, using radical departures from traditional computer architectures. SLALOM provides the only fair means for comparing the old with the new, and tracking progress throughout this revolution.

Patent application filed.

Lawrence Berkeley Laboratory

52. ORTA-LBL-00268
ChemMap
FRAGIADAKIS, C.
Technology Transfer Office, Lawrence Berkeley Laboratory, 1 Cyclotron Road, Berkeley, CA 94720
(510)486-7020

The project concerns software for two-dimensional surface analysis. It is applicable to one- and two-dimensional mapping of chemical composition for solids, liquids, and gases. The software uses state-of-the-art imaging detectors and enables analysis of two-dimensional surfaces to proceed 15,000 times faster than previous methods.

53. ORTA-LBL-00271
FindIt
FRAGIADAKIS, C.
Technology Transfer Office, Lawrence Berkeley Laboratory, 1 Cyclotron Road, Berkeley, CA 94720
(510)486-7020

The project deals with a fault location system for complex processes. New software monitors system behavior, detects deviations, and diagnoses the possible cause. The ability to quickly find and diagnose a complex-system error translates to large savings in process control and factor automation—reduced downtime and improved quality control. It is compatible with most operating systems.

54. ORTA-LBL-00288
New Wellbore Procedure
FRAGIADAKIS, C.
Technology Transfer Office, Lawrence Berkeley Laboratory, 1 Cyclotron Road, Berkeley, CA 94720
(510)486-7020

This new wellbore procedure (a high-resolution instrument/software that characterizes groundwater contamination), co-developed by Lawrence Berkeley Laboratory (LBL) researchers and GZA Geo Environmental Technologies, Inc., provides vital information for solving water quality and supply problems and for improved remediation of contaminated sites. Termed hydrophysical logging, the technique is based on a new concept for measuring fluid flow and allows characterization of growing groundwater problems more quickly, more cost effectively, and with higher resolution than current industry standards.

Oak Ridge Institute for Science and Education

55. ORTA-ORISE-00029
Guidelines Toward an Integrated Emergency Training System
LOGES, M.M.
Office of General Counsel, Oak Ridge Institute for Science and Education, P.O. Box 117, Oak Ridge, TN 37831-0117
(615)576-3756

This system provides the steps toward establishing a comprehensive, integrated emergency training system for U.S. Department of Energy (DOE) and DOE contractor-operated facilities. This training will assist in identifying the required emergency training for all personnel and ensuring that it is conducted and documented. Failing to properly identify and conduct required training places facility personnel, the public, the environment, property, and national security at risk.

56. ORTA-ORISE-00031
Glossary of Environmental Management Terms
LOGES, M.M.
Office of General Counsel, Oak Ridge Institute for Science and Education, P.O. Box 117, Oak Ridge, TN 37831-0117
(615)576-3756

This is a glossary of selected environmental terms as they are defined in environmental laws, regulations, and Department of Energy (DOE) orders. It is arranged in alphabetical order, with the referenced law, regulation, and definition given for each term.

57. ORTA-ORISE-00033
Security Education Job Analysis Project
LOGES, M.M.
Office of General Counsel, Oak Ridge Institute for Science and Education, P.O. Box 117, Oak Ridge, TN 37831-0117
(615)576-3756

This publication will identify the knowledge, skills, and abilities required for the position of security education coordinator in the Department of Energy (DOE) contractor network. The security education job analysis deals with two aspects of a job and task analysis: what people do when they perform their jobs, and what skills and knowledge are necessary to support job performance.

Section II
Patents Available for Licensing from DOE

For further information regarding this section contact Robert J. Marchick, GC-42, 1000 Independence Ave., S.W., Washington, DC 20585.

01 COAL, LIGNITE, AND PEAT

0103 Preparation

58 Apparatus for centrifugal separation of coal particles. Dickie, W.; Cavallaro, J.A.; Killmeyer, R.P. To US DOE, Washington, DC (USA). USA Patent 5,008,083/A/. 16 Apr 1991. Filed date 30 Aug 1988. USA Patent patent application 7-238,213. Int. Cl. B01L 11/00. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a gravimetric cell for centrifugal separation of fine coal by density which has a cylindrical body and a butterfly valve or other apparatus for selectively sealing the body radially across the approximate center of the cylinder. A removable top is provided which seals the cylinder in the centrifuge and in unvented areas.

0104 Processing

Refer also to citation(s) 11, 26

59 Optical access port. Lutz, S.A.; Anderson, R.J. To Dept. of Energy. 14 Sep 1988. USA Patent patent application 7-244,758. 18p. Sponsored by USDOE, Washington, DC (United States). Order Number DE91017341. Source: OSTI; NTIS; GPO Dep.

A 0.025 m diameter optical access port system is provided for a high-pressure (20.4 bars) and high-temperature (538°C) fixed-bed coal gasification process stream. A pair of proximal channels lead into the pipe containing the process stream with the proximal channels disposed on opposite sides of the pipe and coaxial. A pair of ball valves are attached to respective ends of proximal channels for fluidly closing the respective channels in a closed position and for providing a fluid and optical aperture in an open position. A pair of distal channels are connected to respective ball valves. These distal channels are also coaxial with each other and with the proximal channels. Each distal channel includes an optical window disposed therein and associated sealing gaskets. A purge gas is introduced into each distal channel adjacent a respective optical window. The purge gas is heated by a heater before entry into the distal channels. Preferably the optical windows are made of fused silica and the seals are Grafoil gaskets which are pressed against the optical window. 3 figs.

60 Method for dispersing catalyst onto particulate material. Utz, B.R.; Cugini, A.V. To Dept. of Energy. 1990. Filed date 1 Jun 1990. USA Patent patent application 7-531,722. 19p. Sponsored by USDOE, Washington, DC (United States). Order Number DE92003741. Source: OSTI; NTIS; GPO Dep.

A method for dispersing finely divided catalyst precursors onto the surface of coal or other particulate material includes the steps of forming a wet paste mixture of the particulate material and a liquid solution containing a dissolved transition metal salt, for instance a solution of ferric nitrate. The wet paste mixture is in a state of incipient wetness with all of this solution adsorbed onto the surfaces of the particulate material without the presence of free moisture. On adding a precipitating agent such as ammonia, a catalyst precursor such as hydrated iron oxide is deposited on the surfaces of the coal. The catalyst is activated by converting it to the sulfide form for the hydrogenation or direct liquefaction of the coal. 2 figs., 1 tab.

61 Method and apparatus for hot-gas desulfurization of fuel gases. Bissett, L.A. To Dept. of Energy. 1990. Filed date 31 Jul 1990. USA Patent patent application 7-560,666. 24p. Sponsored by USDOE, Washington, DC (United States). Order Number DE92003827. Source: OSTI; NTIS; GPO Dep.

The present invention is directed to a method and apparatus for removing sulfur values from a hot fuel gas stream in a fluidized bed contactor containing particulate sorbent material by employing a riser tube regeneration arrangement. Sulfur-laden sorbent is continuously removed from the fluidized bed through a stand pipe to the riser tube and is rapidly regenerated in the riser tube during transport of the sorbent therethrough by employing an oxygen- containing sorbent regenerating gas stream. The riser tube extends from a location below the fluidized bed to an elevation above the fluidized bed where a gas-solid separating mechanism is utilized to separate the regenerated particulate sorbent from the regeneration gases and reaction gases so that the regenerated sorbent can be returned to the fluidized bed for reuse. 3 figs., 1 tab.

62 **System for pressure letdown of abrasive slurries.** Kasper, S. To Dept. of Energy, Washington, DC (United States). USA Patent 5,052,426/A/. 1 Oct 1991. Filed date 16 Jan 1991. USA Patent patent application 7-641,988. Int. Cl. F17C 13/00. 2p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a system and method for releasing erosive slurries from containment at high pressure without subjecting valves to highly erosive slurry flow. The system includes a pressure letdown tank disposed below the high-pressure tank, the two tanks being connected by a valved line communicating the gas phases and a line having a valve and choke for a transfer of liquid into the letdown tank. The letdown tank has a valved gas vent and a valved outlet line for release of liquid. In operation, the gas transfer line is opened to equalize pressure between tanks so that a low level of liquid flow occurs. The letdown tank is then vented, creating a high-pressure differential between the tanks. At this point, flow between tanks is controlled by the choke. High-velocity, erosive flow through a high-pressure outlet valve is prevented by equalizing the start up pressure and thereafter limiting flow with the choke.

63 **Process and apparatus for coal hydrogenation.** Ruether, J.A.; Simpson, T.B. To US DOE, Washington, DC (USA). USA Patent 5,015,366/A/. 14 May 1991. Filed date 10 Apr 1990. USA Patent patent application 7-506,739. Int. Cl. C10G 1/08. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a coal liquefaction process for an aqueous slurry of coal that is prepared containing a dissolved liquefaction catalyst. A small quantity of oil is added to the slurry and then coal-oil agglomerates are prepared by agitation of the slurry at atmospheric pressure. The resulting mixture is drained of excess water and dried at atmospheric pressure leaving catalyst deposited on the agglomerates. The agglomerates then are fed to an extrusion device where they are formed into a continuous ribbon of extrudate and fed into a hydrogenation reactor at elevated pressure and temperature. The catalytic hydrogenation converts the extrudate primarily to liquid hydrocarbons in the reactor. The liquid drained in recovering the agglomerates is recycled.

0106 Properties and Composition

Refer also to citation(s) 1

0108 Waste Management

Refer also to citation(s) 231

0130 Transport, Handling, and Storage

64 **Supersonic coal water slurry fuel atomizer.** Becker, F.E.; Smolensky, L.A.; Balsavich, J. To Dept. of Energy, Washington, DC (United States). USA Patent 5,044,552/A/. 3 Sep 1991. Filed date 1 Nov 1989. USA Patent patent application 7-430,032. Int. Cl. B05B 7/06. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A supersonic coal water slurry atomizer utilizing supersonic gas velocities to atomize coal water slurry is provided wherein atomization occurs externally of the atomizer. The atomizer has a central tube defining a coal water slurry passageway surrounded by an annular sleeve defining an annular passageway for gas. A converging/diverging section is provided for accelerating gas in the annular passageway to supersonic velocities.

0140 Combustion

Refer also to citation(s) 26

02 PETROLEUM

0202 Reserves, Geology, and Exploration

65 **Fluid driven torisonal dipole seismic source.** Hardee, H.C. To Dept. of Energy, Washington, DC (USA). USA Patent 5,982,811/A/. 8 Jan 1991. Filed date 8 Aug 1989. USA Patent patent application 7-390,810. Int. Cl. G01V 1/40. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a compressible fluid powered oscillating downhole seismic source device capable of periodically generating uncontaminated horizontally-propagated, shear waves. A compressible fluid generated oscillation is created within the device which imparts an oscillation to a housing when the device is installed in a housing such as the cylinder off an existing downhole tool, thereby a torsional seismic source is established. Horizontal waves are transferred to the surrounding borehole medium through downhole clamping.

0203 Drilling and Production

66 **Wellbore inertial directional surveying system.** Andreas, R.D.; Heck, G.M.; Kohler, S.M.; Watts, A.C. To Dept. of Energy, Washington, DC (USA). USA Patent 4,987,684/A/. 29 Jan 1991. Filed date 8 Sep 1982. USA Patent patent application 7-415,941. Int. Cl. G01C 9/00. 12p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a wellbore inertial directional surveying system for providing a complete directional survey of an oil or gas well borehole to determine the displacement in all three directions of the borehole path relative to the well head at the surface. The information generated by the present invention is especially useful when numerous wells are drilled to different geographical targets from a single off-shore platform. Accurate knowledge of the path of the borehole allows proper well spacing and provides assurance that target formations are reached. The tool is lowered down into a borehole on the electrical cable. A computer positioned on the surface communicates with the tool via the cable. The tool contains a sensor block which is supported on a single gimbal, the rotation axis of which is aligned with the cylinder axis of the tool and, correspondingly, the borehole. The gyroscope measurement of the sensor block rotation is used in a null-seeking servo loop which essentially prevents rotation of the sensor block about the gimbal axis. Angular rates of the sensor block about axes which are

perpendicular to the gimbal axis are measured by gyroscopes in a manner similar to a strapped-down arrangement. Three accelerometers provide acceleration information as the tool is lowered within the borehole. The uphole computer derives position information based upon acceleration information and annular rate information. Kalman estimation techniques are used to compensate for system errors.

03 NATURAL GAS

0302 Reserves, Geology, and Exploration

Refer also to citation(s) 8

0303 Drilling, Production, and Processing

Refer also to citation(s) 9

0320 Transport, Handling, and Storage

67 **Rotary pneumatic valve.** Hardee, H.C. To US Dept. of Energy, Washington, DC (USA). USA Patent 4,986,307/A/. 22 Jan 1991. Filed date 2 Aug 1989. USA Patent patent application 7-387,913. Int. Cl. F16K 11/07. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a rotary valve for high-frequency, low-torque application. It comprises a housing including at least one pair of opposing gas inlet and gas exhaust conduits, a valve spindle having at least one bearing at each of first and second ends thereof and provided with at least one pair of opposing slots which upon rotation align with the inlet and exhaust gas conduits respectively, a gap between the interior of the housing and the exterior of the spindle, maintained by the bearings, for separating the spindle from the housing and for centering the spindle inside the housing, and a spindle shaft for rotating the valve spindle, wherein the alignment of the at least one pair of gas inlet and gas exhaust conduits in the housing and the at least one pair of opposing slots in the valve spindle occurs sequentially in response to rotations of the valve spindle such that the rotary valve provides at least two complete switching cycles for every rotation of the valve spindle.

04 OIL SHALES AND TAR SANDS

0404 Oil Production, Recovery, and Refining

68 **Integrated coke, asphalt and jet fuel production process and apparatus.** Shang, J.Y. To US DOE, Washington, DC (United States). USA Patent 5,008,005/A/. 16 Apr 1991. Filed date 17 Oct 1989. USA Patent patent application 7-422,479. Int. Cl. C10G 1/00. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a process and apparatus for the production of coke, asphalt and jet fuel from a feed of fossil fuels containing volatile carbon compounds. The process includes the steps of pyrolyzing the feed in an entrained bed pyrolyzing means, separating the volatile pyrolysis products from the solid pyrolysis products removing at least one coke from the solid pyrolysis products, fractionating the volatile pyrolysis products to produce an overhead stream and a bottom stream which is useful as asphalt for road pavement, condensing the overhead stream to produce a condensed liquid fraction and a noncondensable, gaseous fraction, and removing water from the condensed liquid fraction to produce a jet fuel-containing product. The disclosed apparatus is useful for practicing the foregoing process. The process provides a useful method of mass producing and jet fuels from materials such as coal, oil shale and tar sands.

0406 Products and By-Products

Refer also to citation(s) 11

05 NUCLEAR FUELS

0507 Fuels Production and Properties

69 **Apparatus for injection casting metallic nuclear energy fuel rods.** Seidel, B.R.; Tracy, D.B.; Griffiths, V. To Dept. of Energy, Washington, DC (United States). USA Patent 5,044,911/A/. 3 Sep 1991. Filed date 6 Apr 1989. USA Patent patent application 7-333,935. Int. Cl. B22D 18/06. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

Molds for making metallic nuclear fuel rods are provided which present reduced risks to the environment by reducing radioactive waste. In one embodiment, the mold is consumable with the fuel rod, and in another embodiment, part of the mold can be re-used. Several molds can be arranged together in a cascaded manner, if desired, or several long cavities can be integrated in a monolithic multiple cavity reusable mold.

70 **Nuclear fuel particles and method of making nuclear fuel compacts therefrom.** DeVelasco, R.I.; Adams, C.C. To Dept. of Energy, Washington, DC (United States). USA Patent 5,037,606/A/. 6 Aug 1991. Filed date 9 Sep 1988. USA Patent patent application 7-242,374. Int. Cl. G21C 3/00. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes methods for making nuclear fuel compacts exhibiting low heavy metal contamination and fewer defective coatings following compact fabrication from a mixture of hardenable binder, such as petroleum pitch, and nuclear fuel particles having multiple layer fission-product-retentive coatings, with the dense outermost layer of the fission-product-retentive coating being surrounded by a protective overcoating, e.g., pyrocarbon having a density between about 1 and 1.3 g/cm^3. Such particles can be pre-compacted in molds under relatively high pressures and then combined with a fluid binder which is ultimately carbonized to produce carbonaceous nuclear fuel compacts having relatively high fuel loadings.

0508 Spent Fuels Reprocessing

71 **Enclosed rotary disc air pulser.** Olson, A.L.; Batcheller, T.A.; Rindfleisch, J.A.; Morgan, J.M. To Dept. of Energy. 12 Aug 1988. USA Patent patent application 7-231,427. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE91017147. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of an enclosed rotary disc air pulser for use with a solvent extraction pulse column includes a housing having inlet, exhaust and pulse leg ports, a shaft mounted in the housing and adapted for axial rotation therein, first and second disc members secured to the shaft within the housing in spaced relation to each other to define a chamber there between, the chamber being in communication with the pulse leg port, and first disc member located adjacent the inlet port, the second disc member being located adjacent the exhaust port, each disc member having a milled out portion, the disc members positioned on the shaft so that as the shaft rotates, the milled out portions permit alternative cyclical communication between the inlet port and the chamber and the exhaust port and chamber. 5 figs.

72 **An instrument for the measurement and determination of chemical pulse column parameters.** Marchant, N.J.; Morgan, J.P. To Dept. of Energy. 31 Aug 1988. USA Patent patent application 7-238,661. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE91017338. Source: OSTI; NTIS; GPO Dep.

This invention pertains to an instrument for monitoring and measuring pneumatic driving force pulse parameters applied to chemical separation pulse columns obtains real time pulse frequency and root mean square amplitude values, calculates column inch values and compares these values against preset limits to alert column operators to the variations of pulse column operational parameters beyond desired limits. 2 figs.

73 **Centrifugal contactor with liquid mixing and flow control vanes and method of mixing liquids of different phases.** Jubin, R.T.; Randolph, J.D. To US DOE, Washington, DC (USA). USA Patent 5,024,647/A/. 18 Jun 1991. Filed date 13 Jun 1989. USA Patent patent application 7-365,400. Int. Cl. B01D 21/26. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a centrifugal contactor for solvent extraction systems. The centrifugal contactor is provided with an annular vertically oriented mixing chamber between the rotor housing and the rotor for mixing process liquids such as the aqueous and organic phases of the solvent extraction process used for nuclear fuel reprocessing. A set of stationary helically disposed vanes carried by the housing is in the lower region of the mixing chamber at a location below the process-liquid inlets for the purpose of urging the liquids in an upward direction toward the inlets and enhancing the mixing of the liquids and mass transfer between the liquids. The upper region of the mixing vessel above the inlets for the process liquids is also provided with a set helically disposed vanes carried by the housing for urging the process liquids in a downward direction when the liquid flow rates through the inlets are relatively high and the liquids contact the vane set in the upper region. The use of these opposing vane sets in the mixing zone maintains the liquid in the mixing zone at suitable levels.

74 **Process and apparatus for recovery of fissionable materials from spent reactor fuel by anodic dissolution.** Tomczuk, Z.; Miller, W.E.; Wolson, R.D.; Gay, E.C. To US DOE, Washington, DC (USA). USA Patent 5,009,752/A/. 23 Apr 1991. Filed date 25 Aug 1989. USA Patent patent application 7-398,578. Int. Cl. C25C 3/00. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an electrochemical process and apparatus for the recovery of uranium and plutonium from spent metal clad fuel pins. The process uses secondary reactions between U^{+4} cations and elemental uranium at the anode to increase reaction rates and improve anodic efficiency compared to prior art processes. In another embodiment of the process, secondary reactions between Cd^{+2} cations and elemental uranium to form uranium cations and elemental cadmium also assists in oxidizing the uranium at the anode.

0520 Waste Management

Refer also to citation(s) 17, 59

75 **Process for direct conversion of reactive metals to glass.** Rajan, J.B.; Kumar, R.; Vissers, D.R. To Dept. of Energy. 16 Nov 1988. USA Patent patent application 7-271,967. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE91016850. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This document discovers a method of handling highly radioactive alkali metal that is low in cost, relatively simple to control, easily adapted to continuous production that produces a product in a stable disposable form and at the same time provides a minimum release of radioactivity. Radioactive alkali metal is introduced into a cyclone reactor in droplet form by an aspirating gas. In the cyclone metal reactor the aspirated alkali metal is contacted with silica powder introduced in an air stream to form in one step a glass. The sides of the cyclone reactor are preheated to ensure that the initial glass formed coats the side of the reactor forming a protective coating against the reactants which are maintained in excess of 1000°C to ensure the formation of glass in a single step. 1 fig.

76 **Process for the recovery of strontium from acid solutions.** Horwitz, E.P.; Dietz, M.L. To Dept. of Energy. 1990. Filed date 9 Apr 1990. USA Patent patent application 7-506,125. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE92003841. Source: OSTI; NTIS; GPO Dep.

The invention is a process for selectively extracting strontium and technetium values from aqueous nitric acid waste solutions containing these and other fission product values. The extractant is a macrocyclic polyether in a diluent which is insoluble in water, but which will itself dissolve a small amount of water. The process will extract strontium and technetium values from nitric acid solutions which are up to 6 molar in nitric acid.

77 **Gel bead composition for metal adsorption.** Scott, C.D.; Woodward, C.A.; Byers, C.H. To Dept. of Energy, Washington, DC (USA). USA Patent 4,995,985/A/. 26 Feb 1991. Filed date 25 Apr 1990. USA Patent patent application 7-514,067. Int. Cl. C02F 1/28. 2p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a gel bead comprising propylene glycol alginate and bone gelatin and is capable of removing metals such as Sr and Cs from solution without adding other adsorbents. The invention could have application to the nuclear industry's waste removal activities.

78 **Method of recovering hazardous waste from phenolic resin filters.** Meikrantz, D.H.; Bourne, G.L.; McFee, J.N.; Burdge, B.G.; McConnell, J.W. Jr. To Dept. of Energy, Washington, DC (USA). USA Patent 4,995,916/A/. 26 Feb 1991. Filed date 30 Apr 1990. USA Patent patent application 7-516,936. Int. Cl. B08B 9/00. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a process for the recovery of hazardous wastes such as heavy metals and radioactive elements from phenolic resin filter by circulating a solution of 8 to 16 molar nitric acid at a temperature of 110 to 190 degrees F. through the filter. The hot solution dissolves the filter material and releases the hazardous material so that it can be recovered or treated for long-term storage in an environmentally safe manner.

0550 Safeguards, Inspection, and Accountability

Refer also to citation(s) 129

79 **UHF FM receiver having improved frequency stability and low RFI emission.** Lupinetti, F. To Dept. of Energy. 29 Aug 1988. USA Patent patent application 7-237,191. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE91017333. Source: OSTI; NTIS; GPO Dep.

This invention pertains to a UHF receiver which converts modulated carrier signals to baseband video signals without any heterodyne or frequency conversion stages. A bandpass filter having a fixed frequency first filters the signals. A low noise amplifier amplifies the filtered signal and applies the signal through further amplification stages to a limiter FM demodulator circuit. The UHF signal is directly converted to a baseband video signal. The baseband video signal is clamped by a clamping circuit before driving a monitor. Frequency stability for the receivers is at a theoretical maximum, and interference to adjacent receivers is eliminated due to the absence of a local oscillator. 5 refs.

80 **Vehicle barrier.** Hirsh, R.A. To Dept. of Energy, Washington, DC (USA). USA Patent 4,989,835/A/. 5 Feb 1991. Filed date 15 Apr 1988. USA Patent patent application 7-181,993. Int. Cl. E01F 13/00. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a vehicle security barrier which can be conveniently placed across a gate opening as well as readily removed from the gate opening to allow for easy passage. The security barrier includes a barrier gate in the form of a cable/gate member in combination with laterally attached pipe sections fixed by way of the cable to the gate member and lateral, security fixed vertical pipe posts. The security barrier of the present invention provides for the use of cable restraints across gate openings to provide necessary security while at the same time allowing for quick opening and closing of the gate areas without compromising security.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

0702 Radiation Sources

Refer also to citation(s) 157

81 **Apparatus and method for improving radiation coherence and reducing beam emittance.** Csonka, P.L. To US Dept. of Energy. 20 Oct 1988. USA Patent patent application 7-260,347. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-85ER13309. Order Number DE91017138. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a method and apparatus for increasing the coherence and reducing the emittance of a beam-shaped pulse which operates by splitting the pulse into multiple sub-beams, delaying the propagation of the various sub-beams by varying amounts, and then recombining the sub-beams by means of a rotating optical element to form a pulse of longer duration with improved transverse coherence. 16 figs.

82 **An image focusing means by using an opaque object to diffract x-rays.** Sommargren, M.E.; Weaver, H.J. To Dept. of Energy, Washington, DC (USA). USA Patent 5,022,061/A/. 4 Jun 1991. Filed date 30 Apr 1990. USA Patent patent application 7-516,401. Int. Cl. G21K 1/06. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a method and apparatus for focusing and imaging x-rays. An opaque sphere is used as a diffractive imaging element to diffract x-rays from an object so that the divergent x-ray wavefronts are transformed into convergent wavefronts and are brought to focus to form an image of the object with a large depth of field.

83 **Solid-state radioluminescent compositions.** Clough, R.L.; Gill, J.T.; Hawkins, D.B.; Renschler, C.L.; Shepodd, T.J.; Smith, H.M. To Dept. of Energy, Washington, DC (USA). USA Patent 4,997,597/A/. 5 Mar 1991. Filed date 13 Nov 1989. USA Patent patent application 7-435,092. Int. Cl. C09K 11/04. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a solid state radioluminescent composition for light source comprises an optically clear polymer organic matrix containing tritiated organic materials and dyes capable of red shifting primary scintillation emissions from the polymer matrix. The triated organic materials are made by reducing, with tritium, an unsaturated organic compound that prior to reduction contains olefinic or alkynylic bonds.

08 HYDROGEN

0801 Production

84 Method for producing H_2 using a rotating drum reactor with a pulse jet heat source. Paulson, L.E. To US DOE, Washington, DC (USA). USA Patent 4,976,940/A/. 16 Apr 1991. Filed date 2 Aug 1989. USA Patent patent application 7-388,714. Int. Cl. C01B 3/02. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a method for producing hydrogen by an endothermic steam-carbon reaction using a rotating drum reactor and a pulse jet combustor. The pulse jet combustor uses coal dust as a fuel to provide reaction temperatures of 1300° to 1400°F. Low-rank coal, water, limestone and catalyst are fed into the drum reactor where they are heated, tumbled and reacted. Part of the reaction product from the rotating drum reactor is hydrogen which can be utilized in suitable devices.

09 BIOMASS FUELS

0909 Processing

85 Process of converting starch to glucose and glucose to lactic acid. Tsai, TenLin; Sanville, C.Y.; Coleman, R.D.; Schertz, W.W. To Dept. of Energy. 1990. Filed date 4 Apr 1990. USA Patent patent application 7-504,223. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-33. Order Number DE92003840. Source: OSTI; NTIS; GPO Dep.

This document describes a method for converting starch into lactic acid of sufficient purity for use as a substrate for biodegradable plastics. The process is designed to work on industrial food waste streams such as potato wastes or cheese whey permeate. For potato waste, α-amylase and calcium chloride are added to the starch containing waste and incubated at a pH of 4–7, a temperature of 90–130°C, and a pressure above 15 psi for not less than 15 minutes. At this point, glucoamylase is added and the mixture is incubated at a temperature of 50–70°C and a pH below 6.5 for 4 hours. This results in the conversion of more than 90% of the starch into glucose, which is substantially free of microbial contamination. The hydrolysate is filtered, and introduced with additional nutrients to a fermentor containing a lactose producing microorganism to form a fermentation broth. This results in the fermentation of glucose to lactose, which is filtered and subjected to electrodialysis for purification. Conversion of glucose to lactic acid or lactate occurs with an efficiency of over 95%. 1 fig. (MHB)

86 Hydrocracking of carbohydrates making glycerol, glycols and other polyols. Andrews, M.A.; Klaeren, S.A. To Dept. of Energy, Washington, DC (United States). USA Patent 5,026,927/A/. 25 Jun 1991. Filed date 16 Nov 1989. USA Patent patent application 7-437,403. Int. Cl. C07C 29/14. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A homogeneous process is described for hydrocracking of carbohydrates in the presence of soluble transition metal hydrogenation catalyst with the production of lower polyhydric alcohols. A carbohydrate is contacted with hydrogen in the presence of a soluble transition metal catalyst and a strong base at a temperature of from about 25° C to about 200° C and a pressure of from about 15 to about 3000 psi.

87 Catalysts and method. Taylor, C.E.; Noceti, R.P. To US DOE, Washington, DC (United States). USA Patent 5,019,652/A/. 28 May 1991. Filed date 30 Apr 1990. USA Patent patent application 7-516,611. Int. Cl. C07C 51/215. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This paper describes an improved catalyst and method for the oxyhydrochlorination of methane. The catalyst includes a pyrogenic porous support on which is layered as active material, cobalt chloride in major proportion, and minor proportions of an alkali metal chloride and of a rare earth chloride. on contact of the catalyst with a gas flow of methane, HCl and oxygen, more than 60% of the methane is converted and of that converted more than 40% occurs as monochloromethane. Advantageously, the monochloromethane can be used to produce gasoline boiling range hydrocarbons with the recycle of HCl for further reaction. This catalyst is also of value for the production of formic acid as are analogous catalysts with lead, silver or nickel chlorides substituted for the cobalt chloride.

0920 Combustion

Refer also to citation(s) 156

10 SYNTHETIC FUELS

1002 Production

Refer also to citation(s) 29

88 Catalysts for synthesizing various short chain hydrocarbons. Colmenares, C. To Dept. of Energy, Washington, DC (United States). USA Patent 5,030,607/A/. 9 Jul 1991. Filed date 5 May 1989. USA Patent patent application 7-347,765. Int. Cl. B01J 21/00. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

Method and apparatus, including novel photocatalysts, are disclosed for the synthesis of various short chain hydrocarbons. Light-transparent SiO_2 aerogels doped with photochemically active uranyl ions are fluidized in a fluidized-bed reactor having a transparent window, by hydrogen and CO, C_2H_4 or C_2H_6 gas mixtures, and exposed to radiation from a light source external to the reactor, to produce the short chain hydrocarbons.

14 SOLAR ENERGY

1405 Solar Energy Conversion

89 Method of making semiconductor junctions. James, R.B. To Dept. of Energy. 1990. Filed date 13 Jun 1990. USA Patent patent application 7-537,957. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DR00789. Order Number DE92003686. Source: OSTI; NTIS; GPO Dep.

A p-n junction on a silicon substrate doped with boron ions (d- dopant) is made in following manner. A shallow silicon surface layer including a n-type dopant is first obtained by ion implantation of the substrate with arsenic atoms. The arsenic-doped silicon layer at the surface has a relatively low initial reflectivity. Then, radiation from a pulsed carbon dioxide laser is directed onto the doped surface. A portion of the pulsed radiation causes melting of the thin arsenic-doped layer at the solid surface, giving the shallow melted surface a reflectivity greater than the initial reflectivity of the solid surface. The increased reflectivity of the melted surface prevents an additional portion of the pulsed radiation from causing further melting, thus controlling the depth of melting. The melted surface is then allowed to cool and solidify to form a p-n junction at a thin (less than 200 angstrom) junction depth. 6 figs.

90 Method for preparing homogeneous single crystal ternary III-V alloys. Ciszek, T.F. To Dept. of Energy, Washington, DC (United States). USA Patent 5,047,112/A/. 10 Sep 1991. Filed date 14 Aug 1990. USA Patent patent application 7-566,930. Int. Cl. C30B 29/00. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A method is described for producing homogeneous, single-crystal III-V ternary alloys of high crystal perfection using a floating crucible system in which the outer crucible holds a ternary alloy of the composition desired to be produced in the crystal and an inner floating crucible having a narrow, melt-passing channel in its bottom wall holds a small quantity of melt of a pseudo-binary liquids composition that would freeze into the desired crystal composition. The alloy of the floating crucible is maintained at a predetermined lower temperature than the alloy of the outer crucible, and a single crystal of the desired homogeneous alloy is pulled out of the floating crucible melt, as melt from the outer crucible flows into a bottom channel of the floating crucible at a rate that corresponds to the rate of growth of the crystal.

91 Monolithic tandem solar cell. Wanlass, M.W. To US DOE, Washington, DC (USA). USA Patent 5,019,177/A/. 28 May 1991. Filed date 3 Nov 1989. USA Patent patent application 7-431,364. Int. Cl. H01L 31/068. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a single-crystal, monolithic, tandem, photovoltaic solar cell which includes an InP substrate having an upper and lower surfaces, a first photoactive subcell on the upper surface of the InP substrate, and a second photoactive subcell on the first subcell. The first photovoltaic subcell is GaInAsP of defined composition. The second subcell is InP. The two subcells are lattice matched. The solar cell can be provided as a two- terminal device or a three-terminal device.

92 Photovoltaic cell assembly. Beavis, L.C.; Panitz, J.K.G.; Sharp, D.J. To US Dept. of Energy, Washington, DC (USA). USA Patent 4,971,633/A/. 20 Nov 1990. Filed date 26 Sep 1989. USA Patent patent application 7-412,711. Int. Cl. H01L 31/052. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a photovoltaic assembly for converting high intensity solar radiation into electrical energy in which a solar cell is separated from a heat sink by a thin layer of a composite material which has excellent dielectric properties and good thermal conductivity. This composite material is a thin film of porous Al_2O_3 in which the pores have been substantially filled with an electrophoretically-deposited layer of a styrene-acrylate resin. This composite provides electrical breakdown strengths greater than that of a layer consisting essentially of Al_2O_3 and has a higher thermal conductivity than a layer of styrene-acrylate alone.

1410 Solar Collectors and Concentrators

93 Passivation coating for flexible substrate mirrors. Tracy, C.E.; Benson, D.K. To US Dept. of Energy. 19 Oct 1988. USA Patent patent application 7-259,634. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE91017137. Source: OSTI; NTIS; GPO Dep.

A protective diffusion barrier for metalized mirror structures is provided by a layer of coating of silicon nitride which is a very dense, transparent, dielectric material that is impervious to water, alkali, and other impurities and corrosive substances that typically attack the metal layers of mirrors and cause degradation of the mirrors' reflectivity. The silicon nitride layer can be deposited on the substrate before metal deposition thereon to stabilize the metal/substrate interface, and it can be deposited over the metal to encapsulate it and protect the metal from corrosion or other degradation. Mirrors coated with silicon nitride according to this invention can also be used as front surface mirrors. Also, the silver or other reflective metal layer on mirrors comprising thin, light-weight, flexible substrates of metal or polymer sheets coated with glassy layers can be protected with silicon nitride according to this invention. 13 figs.

15 GEOTHERMAL ENERGY

1509 Geothermal Engineering

Refer also to citation(s) 199

20 FOSSIL-FUELED POWER PLANTS

2002 Waste Management

Refer also to citation(s) 64, 231

21 NUCLEAR POWER REACTORS AND ASSOCIATED PLANTS

2105 Power Reactors, Breeding

Refer also to citation(s) 18

22 NUCLEAR REACTOR TECHNOLOGY

2202 Components and Accessories

Refer also to citation(s) 141

94 **Reactor vessel annealing system.** Miller, P.E.; Katz, L.R.; Nath, R.J.; Blaushild, R.M.; Tatch, M.D.; Kordalski, F.J.; Wykstra, D.T.; Kavalkovich, W.M. To US DOE, Washington, DC (USA). USA Patent 5,025,129/A/. 18 Jun 1991. Filed date 19 Jun 1989. USA Patent patent application 7-368,456. Int. Cl. C21D 9/00. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a system for annealing a vessel in situ by heating the vessel to a defined temperature. It includes an electrically operated heater assembly insertable into the vessel for heating the vessel to the defined temperature; temperature monitoring components positioned relative to the heater assembly for monitoring the temperature of the vessel; a controllable electric power supply unit for supplying electric power required by the heater assembly; a control unit for controlling the power supplied by the power supply unit; a first vehicle containing the power supply unit; a second vehicle containing the control unit; power conductors connectable between the power supply unit and the heater unit for delivering the power supplied by the power supply unit to the heater assembly.

95 **Nuclear qualified in-containment electrical connectors and method of connecting electrical conductors.** Powell, J.G. To Dept. of Energy, Washington, DC (United States). USA Patent 5,047,594/A/. 10 Sep 1991. Filed date 9 Jul 1990. USA Patent patent application 7-549,982. Int. Cl. H02G 15/08. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A nuclear qualified in-containment electrical connection comprises an insulated, sheathed instrument lead having electrical conductors extending from one end thereof to provide two exposed lead wires, a watertight cable having electrical conducting wires therein and extending from one end of the cable to provide two lead wires therefrom, two butt splice connectors each butt splice connector and an adjacent portion of a respective lead wire from the cable and heat shrunk into position, a length of heat shrinkable plastic tubing on the end portion of the instrument lead and the heat shrinkable tubing thereon and over the butt splice connectors and a portion of the cable adjacent the cable lead lines, the outer heat shrinkable tubing being heat shrunk into sealing position on the instrument lead and cable.

2203 Fuel Elements

Refer also to citation(s) 12, 13, 40, 42

96 **Critical heat flux test apparatus.** Welsh, R.E.; Doman, M.J.; Wilson, E.C. To Dept. of Energy. 1990. Filed date 31 May 1990. USA Patent patent application 7-531,355. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-76PN00014. Order Number DE92003661. Source: OSTI; NTIS; GPO Dep.

An apparatus for testing, in situ, highly irradiated specimens at high temperature transients is provided. A specimen, which has a thermocouple device attached thereto, is manipulated into test position in a sealed quartz heating tube by a robot. An induction coil around a heating portion of the tube is powered by a radio frequency generator to heat the specimen. Sensors are connected to monitor the temperatures of the specimen and the induction coil. A quench chamber is located below the heating portion to permit rapid cooling of the specimen which is moved into this quench chamber once it is heated to a critical temperature. A vacuum pump is connected to the apparatus to collect any released fission gases which are analyzed at a remote location.

97 **Nuclear fuel element.** Zocher, R.W. To Department of Energy, Washington, DC (USA). USA Patent 5,002,723/A/. 26 Mar 1991. Filed date 6 Apr 1989. USA Patent patent application 7-333,934. Int. Cl. B21C 3/00. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a nuclear fuel element and a method of manufacturing the element. The fuel element is comprised of a metal primary container and a fuel pellet which is located inside it and which is often fragmented. The primary container is subjected to elevated pressure and temperature to deform the container such that the container conforms to the fuel pellet, that is, such that the container is in substantial contact with the surface of the pellet. This conformance eliminates clearances which permit rubbing together of fuel pellet fragments and rubbing of fuel pellet fragments against the container, thus reducing the amount of dust inside the fuel container and the amount of dust which may escape in the event of container breach. Also, as a result of the inventive method, fuel pellet fragments tend to adhere to one another to form a coherent non-fragmented mass; this reduces the tendency of a fragment to pierce the container in the event of impact.

2204 Control Systems

98 **Nuclear reactor with internal thimble-type delayed neutron detection system.** Gross, K.C.; Poloncsik,

J.; Lambert, J.D.B. To Dept. of Energy. 17 Nov 1988. USA Patent patent application 7-272,583. 38p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE91016851. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention teaches improved apparatus for the method of detecting a breach in cladded fuel used in a nuclear reactor. The detector apparatus is located in the primary heat exchanger which conveys part of the reactor coolant past at least three separate delayed-neutron detectors mounted in this heat exchanger. The detectors are spaced apart as that the coolant flow time from the core to each detector is different, and these differences are known. The delayed-neutron activity at the detectors is a function of the delay time after the reaction in the fuel until the coolant carrying the delayed-neutron emitter passes the respective detector. This time delay is broken down into separate components including an isotopic holdup time required for the emitter to move through the fuel from the reaction to the coolant at the breach, and two transit times required for the emitter now in the coolant to flow from the breach to the detector loop and then via the loop to the detector. At least two of these time components are determined during calibrated operation of the reactor. Thereafter during normal reactor operation, repeated comparisons are made by the method of regression approximation of the third time component for the best-fit line correlating measured delayed-neutron activity against that is approximated according the specific equations. The equations use these time-delay components and known parameter values of the fuel and of the part and emitting daughter isotopes. 9 figs.

99 Speed control with end cushion for high speed air cylinder. Stevens, W.W.; Solbrig, C.W. To Dept. of Energy, Washington, DC (United States). USA Patent 5,034,184/A/. 23 Jul 1991. Filed date 20 Jun 1989. USA Patent patent application 7-368,637. Int. Cl. G21C 7/20. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a high speed air cylinder in which the longitudinal movement of the piston within the air cylinder tube that is controlled by pressurizing the air cylinder tube on the accelerating side of the piston and releasing pressure at a controlled rate on the decelerating side of the piston. The invention also includes a method for determining the pressure required on both the accelerating and decelerating sides of the piston to move the piston with a given load through a predetermined distance at the desired velocity, bringing the piston to rest safely without piston bounce at the end of its complete stroke.

100 Neutron activated switch. Barton, D.M. To US DOE, Washington, DC (USA). USA Patent 5,015,433/A/. 14 May 1991. Filed date 30 Oct 1989. USA Patent patent application 7-428,681. Int. Cl. G21C 17/00. 2p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a switch for reacting quickly to a neutron emission. A rod consisting of fissionable material is located inside a vacuum tight body. An adjustable contact is located coaxially at an adjustable distance from one end of the rod. Electrical leads are connected to the rod and to the adjustable contact. With a vacuum drawn inside the body, a neutron bombardment striking the rod causes it to heat and expand longitudinally until it comes into contact with the adjustable contact. This circuit closing occurs within a period of a few microseconds.

2206 Research, Test, Training, Production, Irradiation, Materials Testing Reactors

Refer also to citation(s) 41

2209 Reactor Safety

Refer also to citation(s) 41, 166

101 Hydrogen gas sensor and method of manufacture. McKee, J.M. To US DOE, Washington, DC (USA). USA Patent 5,012,672/A/. 7 May 1991. Filed date 17 Jul 1989. USA Patent patent application 7-382,199. Int. Cl. G01N 37/00. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a sensor for measuring the pressure of hydrogen gas in a nuclear reactor, and method of manufacturing the same. The sensor comprises an elongated tube of hydrogen permeable material which is connected to a pressure transducer through a feedthrough tube which passes through a wall at the boundary of the region in which hydrogen is present. The tube is pressurized and flushed with hydrogen gas at an elevated temperature during the manufacture of the sensor in order to remove all gasses other than hydrogen from the device.

24 POWER TRANSMISSION AND DISTRIBUTION

102 High frequency rectenna. Logan, B.G.; Orvis, W.J. To Dept. of Energy, Washington, DC (United States). USA Patent 5,043,739/A/. 27 Aug 1991. Filed date 30 Jan 1990. USA Patent patent application 7-472,548. Int. Cl. H01Q 1/26. 6p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

The invention provides an inexpensive array of rectifying antennas which employ field emission diodes for rectifying electromagnetic waves of microwave frequencies and higher frequencies.

103 Ultra-high speed permanent magnet axial gap alternator with multiple stators. Hawsey, R.A.; Bailery, J.M. To Dept. of Energy, Washington, DC (USA). USA Patent 4,996,457/A/. 26 Feb 1991. Filed date 28 Mar 1990. USA Patent patent application 7-500,353. Int. Cl. H02K 1/28. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an ultra-high speed, axial gap alternator that can provide an output to loads, the alternator providing magnetic isolation such that operating conditions in one load will not affect operating conditions of another load. This improved alternator uses a rotor member disposed between a pair of stator members, with magnets disposed in each of the rotor member surfaces facing the

stator members. The magnets in one surface of the rotor member, which alternate in polarity, are isolated from the magnets in the other surface of the rotor member by a disk of magnetic material disposed between the two sets of magnets. In the preferred embodiment, this disk of magnetic material is laminated between two layers of non-magnetic material that support the magnets, and the magnetic material has a peripheral rim that extends to both surfaces of the rotor member to enhance the structural integrity.

2401 Power Systems

104 High voltage electrical amplifier having a short rise time. Christie, D.J.; Dallum, G.E. To Dept. of Energy, Washington, DC (United States). USA Patent 5,049,836/A/. 17 Sep 1991. Filed date 7 Dec 1989. USA Patent patent application 7-447,454. Int. Cl. H03F 3/195. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a circuit, comprising an amplifier and a transformer which is disclosed that produces a high power pulse having a fast response time, and that responds to a digital control signal applied through a digital-to-analog converter. The present invention is suitable for driving a component such as an electro-optic modulator with a voltage in the kilovolt range. The circuit is stable at high frequencies and during pulse transients, and its impedance matching circuit matches the load impedance with the output impedance. The preferred embodiment comprises an input stage compatible with high-speed semiconductor components for amplifying the voltage of the input control signal, a buffer for isolating the input stage from the output stage; and a plurality of current amplifiers connected to the buffer. Each current amplifier is connected to a field effect transistor (FET), which switches a high voltage power supply to a transformer which then provides an output terminal for driving a load. The transformer comprises a plurality of transmission lines connected to the FETs and the load. The transformer changes the impedance and voltage of the output. The preferred embodiment also comprises a low voltage power supply for biasing the FETs at or near an operational voltage.

105 Off-set stabilizer for comparator output. Lunsford, J.S. To Dept. of Energy, Washington, DC (United States). USA Patent 5,030,850/A/. 9 Jul 1991. Filed date 26 Feb 1990. USA Patent patent application 7-484,321. Int. Cl. H03K 5/153. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a stabilized off-set voltage that is input as the reference voltage to a comparator. In application to a time-interval meter, the comparator output generates a timing interval which is independent of drift in the initial voltage across the timing capacitor. A precision resistor and operational amplifier charge a capacitor to a voltage which is precisely offset from the initial voltage. The capacitance of the reference capacitor is selected so that substantially no voltage drop is obtained in the reference voltage applied to the comparator during the interval to be measured.

2402 Power System Networks, Transmission and Distribution

106 Wedge assembly for electrical transformer component spacing. Baggett, F.E.; Cage, W.F. To Dept. of Energy. 1990. Filed date 4 Jun 1991. USA Patent patent application 7-532,545. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE92003742. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a wedge assembly that is easily inserted between two surface to be supported thereby, and thereafter expanded to produce a selected spacing between those surfaces. This wedge assembly has two outer members that are substantially identical except that they are mirror images of each other. Oppositely directed faces of these of these outer members are substantially parallel for the purpose of contacting the surfaces to be separated. The other faces of these outer members that are directed toward each other are tapered so as to contact a center member having complementary tapers on both faces. A washer member is provided to contact a common end of the outer members, and a bolt member penetrates this washer and is threadably received in a receptor of the center member. As the bolt member is threaded into the center member, the center member is drawn further into the gap between the outer members and thereby separates these outer members to contact the surfaces to be separated. In the preferred embodiment, the contacting surfaces of the outer member and the center member are provided with guide elements. The wedge assembly is described for use in separating the secondary windings from the laminations of an electrical power transformer.

25 ENERGY STORAGE

2504 Capacitor Banks

Refer also to citation(s) 47

2505 Flywheels

107 High speed flywheel. McGrath, S.V. To US DOE, Washington, DC (USA). USA Patent 5,012,694/A/. 7 May 1991. Filed date 29 Jan 1990. USA Patent patent application 7-471,341. Int. Cl. F16F 15/30. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a flywheel for operation at high speed which utilizes two or more ringlike components arranged in a spaced concentric relationship for rotation about an axis and an expansion device interposed between the components for accommodating radial growth of the components resulting from flywheel operation. The expansion device engages both of the ringlike components, and the structure of the expansion device ensures that it maintains its engagement with the components. In addition to its expansion-accommodating capacity, the expansion device also maintains flywheel stiffness during flywheel operation.

2509 Batteries

Refer also to citation(s) 113

108 Overcharge tolerant high-temperature cells and batteries. Laszlo, R.; Nelson, P.A. To Dept. of Energy. 1 Aug 1988. USA Patent patent application 7-227,021. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE91017146. Source: OSTI; NTIS; GPO Dep.

In a lithium-alloy/metal sulfide high temperature electrochemical cell, cell damage caused by overcharging is avoided by providing excess lithium in a high-lithium solubility phase alloy in the negative electrode and a specified ratio maximum of the capacity of a matrix metal of the negative electrode in the working phase to the capacity of a transition metal of the positive electrode. In charging the cell, or a plurality of such cells in series and/or parallel, chemical transfer of elemental lithium from the negative electrode through the electrolyte to the positive electrode provides sufficient lithium to support an increased self-charge current to avoid anodic dissolution of the positive electrode components above a critical potential. The lithium is subsequently electrochemically transferred back to the negative electrode in an electrochemical/chemical cycle which maintains high self-discharge currents on the order of 3–15 mA/cm^2 in the cell to prevent overcharging. 6 figs.

109 Chemically stable battery membrane. Arnold, C. Jr.; Assink, R.A.; Hollandsworth, R.P. To Dept. of Energy. 5 Oct 1988. USA Patent patent application 7-253,633. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE91017351. Source: OSTI; NTIS; GPO Dep.

For batteries containing strong oxidizing electrolytes and a membrane separating two electrolyte solutions, e.g., a zinc/ferrocyanide battery, an improved oxidation-resistant, conductive, ion-selective membrane fabricated from an inert porous perfluorinated polymer sheet, e.g., of poly(tetrafluoroethylene), radiatively grafted with α-methylstyrene and adequately sulfonated. A minor quantity of a divinyl compound is preferably added to the α-methylstyrene to crosslink the grafted structure. 5 figs.

30 DIRECT ENERGY CONVERSION

3005 Fuel Cells

Refer also to citation(s) 113, 117

110 Preventing CO poisoning in fuel cells. Gottesfeld, S. To Dept. of Energy. 5 Dec 1988. USA Patent patent application 7-279,694. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE91016856. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Proton exchange membrane (PEM) fuel cell performance with CO contamination of the H_2 fuel stream is substantially improved by injecting O_2 into the fuel stream ahead of the fuel cell. It is found that a surface reaction occurs even at PEM operating temperatures below about 100°C to oxidatively remove the CO and restore electrode surface area for the H_2 reaction to generate current. Using an O_2 injection, a suitable fuel stream for a PEM fuel cell can be formed from a methanol source using conventional reforming processes for producing H_2. 4 figs.

111 Corrosion free phosphoric acid fuel cell. Wright, M.K. To Dept. of Energy, Washington, DC (USA). USA Patent 4,978,591/A/. 18 Dec 1990. Filed date 11 Sep 1989. USA Patent patent application 7-405,718. Int. Cl. H01M 2/08. 2p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a phosphoric acid fuel cell with an electrolyte fuel system which supplies electrolyte via a wick disposed adjacent a cathode to an absorbent matrix which transports the electrolyte to portions of the cathode and an anode which overlaps the cathode on all sides to prevent corrosion within the cell.

112 Dry compliant seal for phosphoric acid fuel cell. Granata, S.J. Jr.; Woodle, B.M. To Dept. of Energy, Washington, DC (USA). USA Patent 4,978,590/A/. 18 Dec 1990. Filed date 11 Sep 1989. USA Patent patent application 7-405,716. Int. Cl. H01M 2/08. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a dry compliant overlapping seal for a phosphoric acid fuel cell preformed of non-compliant Teflon to make an anode seal frame that encircles an anode assembly, a cathode seal frame that encircles a cathode assembly and a compliant seal frame made of expanded Teflon, generally encircling a matrix assembly. Each frame has a thickness selected to accommodate various tolerances of the fuel cell elements and are either bonded to one of the other frames or to a bipolar or end plate. One of the non-compliant frames is wider than the other frames forming an overlap of the matrix over the wider seal frame, which cooperates with electrolyte permeating the, matrix to form a wet seal within the fuel cell that prevents process gases from intermixing at the periphery of the fuel cell and a dry seal surrounding the cell to keep electrolyte from the periphery thereof. The frames may be made in one piece, in L-shaped portions or in strips and have an outer perimeter which registers with the outer perimeter of bipolar or end plates to form surfaces upon which flanges of pan shaped, gas manifolds can be sealed.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

3201 Buildings

Refer also to citation(s) 49

113 Pupillary efficient lighting system. Berman, S.M.; Jewett, D.L. To US DOE, Washington, DC (USA). USA Patent 5,015,924/A/. 14 May 1991. Filed date 14 Apr 1989. USA Patent patent application 7-337,971. Int. Cl. H05B 37/02. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a lighting system having at least two independent lighting subsystems each with a different ratio of scotopic illumination to photopic illumination. The radiant energy in the visible region of the spectrum of the lighting subsystems can be adjusted relative to each other so that the total scotopic illumination of the combined system and the total photopic illumination of the combined system can be varied independently. The dilation or contraction of the pupil of an eye is controlled by the level of scotopic illumination and because the scotopic and photopic illumination can be separately controlled, the system allows the pupil size to be varied independently of the level of photopic illumination. Hence, the vision process can be improved for a given level of photopic illumination.

114 Acoustic emission feedback control for control of boiling in a microwave oven. White, T.L. To Dept. of Energy, Washington, DC (USA). USA Patent 4,996,403/A/. 26 Feb 1991. Filed date 5 Feb 1990. USA Patent patent application 7-474,906. Int. Cl. H05B 6/68. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an acoustic emission based feedback system for controlling the boiling level of a liquid medium in a microwave oven. The acoustic emissions from the medium correlated with surface boiling is used to generate a feedback control signal proportional to the level of boiling of the medium. This signal is applied to a power controller to automatically and continuously vary the power applied to the oven to control the boiling at a selected level.

3202 Transportation

Refer also to citation(s) 62, 63, 152

3203 Industrial and Agricultural Processes

Refer also to citation(s) 232

115 Removal of metal ions from aqueous solution. Jackson, P.J.; Delhaize, E.; Robinson, N.J.; Unkefer, C.J.; Furlong, C. To Dept. of Energy. 26 Aug 1988. USA Patent patent application 7-237,263. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE91017334. Source: OSTI; NTIS; GPO Dep.

A method of removing heavy metals from aqueous solution, a composition of matter used in effecting said removal, and apparatus used in effecting said removal. One or more of the polypeptides, poly (γ-glutamylcysteinyl)glycines, is immobilized on an inert material in particulate form. Upon contact with an aqueous solution containing heavy metals, the polypeptides sequester the metals, removing them from the solution. There is selectivity of poly (γ-glutamylcysteinyl)glycines having a particular number of monomer repeat units for particular metals. The polypeptides are easily regenerated by contact with a small amount of an organic acid, so that they can be used again to remove heavy metals from solution. This also results in the removal of the metals from the column in a concentrated form.

116 Microwave-enhanced chemical processes. Varma, R. To Dept. of Energy. 15 Sep 1988. USA Patent patent application 7-244,779. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE91017343. Source: OSTI; NTIS; GPO Dep.

This invention pertains to a process for disposal of toxic wastes including chlorinated hydrocarbons, comprising, establishing a bed of non-metallic particulates having a high dielectric loss factor. Effecting intimate contact of the particulates and the toxic wastes at a temperature in excess of about 400°C. In the presence of microwave radiation for a time sufficient to break the hydrocarbon chlorine bonds and provide detoxification values in excess of 80 and further detoxifying the bed followed by additional disposal of toxic wastes.

117 Destruction of organic wastes with molten oxidizers. Bradshaw, R.W.; Holmes, J.T.; Tyner, C.E. To Dept. of Energy. 1990. Filed date 2 Apr 1990. USA Patent patent application 7-502,957. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE92003833. Source: OSTI; NTIS; GPO Dep.

A process for destruction of biologically hazardous organic chemical wastes by using liquefied strongly oxidizing inorganic salts, such as the alkali metal nitrates, at high temperatures and atmospheric pressure, to yield inorganic salts, carbon dioxide, and water. The oxidizing salts are regenerated and recycled.

33 ADVANCED PROPULSION SYSTEMS

Refer also to citation(s) 152

118 Reflector for efficient coupling of a laser beam to air or other fluids. Kare, J.T. To Dept. of Energy. 1990. Filed date 18 Jul 1990. USA Patent patent application 7-554,728. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE92003824. Source: OSTI; NTIS; GPO Dep.

A reflector array is disclosed herein that provides a controlled region or regions of plasma breakdowns from a laser beam produced at a remotely-based laser source. The plasma may be applied to produce thrust to propel a spacecraft, or to diagnose a laser beam, or to produce shockwaves. The spacecraft propulsion system comprises a reflector array attached to the vehicle. The reflector array comprises a plurality of reflectors spaced apart on a reflective surface, with each reflector acting as an independent focusing mirror. The reflectors are spaced closely together to form a continuous or partially-continuous surface. The reflector array may be formed from a sheet of reflective material, such as copper or aluminum. In operation, a beam of electromagnetic energy, such as a laser beam, is directed at the reflectors which focus the reflected electromagnetic energy at a plurality of regions off the surface. The energy concentrated in the focal region causes a breakdown of the air or other fluids in the focal region, creating a plasma. Electromagnetic energy is absorbed in the plasma and it grows in volume, compressing and heating the adjacent

fluid thereby providing thrust. Laser pulses may be applied repetitively. After each such thrust pulse, fresh air can be introduced next to the surface either laterally, or through a perforated surface. If air or some other gas or vapor is supplied, for example from a tank carried on board a vehicle, this invention may also be used to provide thrust in a vacuum environment. 8 figs.

119 **Miniaturized pressurization system.** Whitehead, J.C.; Swink, D.G. To Dept. of Energy, Washington, DC (United States). USA Patent 5,026,259/A/. 25 Jun 1991. Filed date 9 Jul 1990. USA Patent patent application 7-550,280. Int. Cl. F04B 9/08. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

The invention uses a fluid stored at a low pressure and provides the fluid at a high pressure. The invention allows the low pressure fluid to flow to a fluid bore of a differential pump and from the pump to a fluid pressure regulator. After flowing through the regulator the fluid is converted to a gas which is directed to a gas bore of the differential pump. By controlling the flow of gas entering and being exhausted from the gas bore, the invention provides pressure to the fluid. By setting the regulator, the high pressure fluid can be set at predetermined values. Because the invention only needs a low pressure fluid, the inventive apparatus has a low mass, and therefore would be useful in rocket propulsion systems.

3303 Electric-Powered Systems

Refer also to citation(s) 161

3305 Flywheel Propulsion

Refer also to citation(s) 51

3307 Emission Control

120 **Particle entrapping filamentry structures.** Steele, W.A.; Leider, H.R.; Mohr, P.B. To Dept. of Energy. 29 Sep 1988. USA Patent patent application 7-250,592. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE91017347. Source: OSTI; NTIS; GPO Dep.

Minute particulates are removed from a fluid flow by directing the fluid towards a particle entrapping element having a hair-like covering a flexible filaments. The filaments have fixed root ends and movable free ends that extend away from the roots and are shiftable in response to flow pressure and particle impacts. Particles lodge within the mass of filaments while the fluid component of the flow passes through particle entrapping element if the substrate is porous or is deflected away if the substrate is impervious. The structure does not necessarily cause a sizable pressure drop in the flow and can entrap large quantities of particulates. The invention has a variety of specific applications such as, for example, removal of smoke from the exhaust gases of vehicle engines or stationary fuel consuming installations. 11 figs.

36 MATERIALS

3601 Metals and Alloys

Refer also to citation(s) 36, 205

121 **Electromagnetic confinement and movement of thin sheets of molten metal.** Lari, R.J.; Praeg, W.F.; Turner, L.R. To US Dept. of Energy. 18 Oct 1988. USA Patent patent application 7-259,389. 41p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE91017136. Source: OSTI; NTIS; GPO Dep.

An apparatus capable of producing a combination of magnetic fields that can retain a metal in liquid form in a region having a smooth vertical boundary including a levitation magnet that produces low frequency magnetic field traveling waves to retain the metal and a stabilization magnet that produces a high frequency magnetic field to produce a smooth vertical boundary. As particularly adapted to the casting of solid metal sheets, a metal in liquid form can be continuously fed into one end of the confinement region produced by the levitation and stabilization magnets and removed in solid form from the other end of confinement region. An additional magnet may be included for support at the edges of the confinement region where eddy currents loop.

122 **Dispersion strengthened copper.** Sheinberg, H.; Meek, T.T.; Blake, R.D. To Dept. of Energy. 5 Dec 1988. USA Patent patent application 7-281,158. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE91016857. Source: OSTI; NTIS; GPO Dep.

A composition of matter comprised of copper and particles which are dispersed throughout the copper, where the particles are comprised of copper oxide and copper having a coating of copper oxide, and a method for making this composition of matter.

123 **Solder extrusion pressure bonding process and bonded products produced thereby.** Beavis, L.C.; Karnowsky, M.M.; Yost, F.G. To Dept. of Energy. 1990. Filed date 20 Apr 1990. USA Patent patent application 7-511,684. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE92004603. Source: OSTI; NTIS; GPO Dep.

Production of soldiered joints which are highly reliable and capable of surviving 10,000 thermal cycles between about −40°C and 110°C. Process involves interposing a thin layer of a metal solder composition between the metal surfaces of members to be bonded and applying heat and up to about 1000 psi compression pressure to the superposed members, in the presence of a reducing atmosphere, to extrude the major amount of the solder composition, contaminants including fluxing gases and air, from between the members being bonded, to form a very thin, strong intermetallic bonding layer having a thermal expansion tolerant with that of the bonded members.

124 **Electrochemical polishing of thread fastener test specimens of nickel-chromium iron alloys.** Kephart,

A.R. To Dept. of Energy. 1990. Filed date 3 Jul 1990. USA Patent patent application 7-547,370. 17p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC12-76SN00052. Order Number DE92003818. Source: OSTI: NTIS; GPO Dep.

An electrochemical polishing device and method for selective anodic dissolution of the surface of the test specimens comprised, for example, of nickel-chromium-iron alloys, which provides for uniform dissolution at the localized sites to remove metal through the use of a coiled wire electrode (cathode) placed in the immediate proximity of the working, surface resulting in a polished and uniform grain boundary.

125 **Apparatus for gas-metal arc deposition.** Buhrmaster, C.L.; Clark, D.E.; Smartt, H.B. To Dept. of Energy, Washington, DC (United States). USA Patent 5,052,331/A/. 1 Oct 1991. Filed date 29 May 1990. USA Patent patent application 7-529,412. Int. Cl. B05C 5/04. 6p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes an apparatus for gas- metal arc deposition of metal, metal alloys, and metal matrix composites. The apparatus contains an arc chamber for confining a D.C. electrical arc discharge, the arc chamber containing an outlet orifice in fluid communication with a deposition chamber having a deposition opening in alignment with the orifice for depositing metal droplets on a coatable substrate. Metal wire is passed continuously into the arc chamber in alignment with the orifice. Electric arcing between the metal wire anode and the orifice cathode produces droplets of molten metal from the wire which pass through the orifice and into the deposition chamber for coating a substrate exposed at the deposition opening. When producing metal matrix composites, a suspension of particulates in an inert gas enters the deposition chamber via a plurality of feed openings below and around the orifice so that reinforcing particulates join the metal droplets to produce a uniform mixture which then coats the exposed substrate with a uniform metal matrix composite.

126 **Nondestructive method for chemically machining crucibles fo. molds from their enclosed ingots and castings.** Stout, N.D.; Newkirk, H.W. To Dept. of Energy, Washington, DC (United States). USA Patent 5,035,769/A/. 30 Jul 1991. Filed date 4 Oct 1989. USA Patent patent application 7-417,146. Int. Cl. B44C 1/22. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes an inventive method for chemically machining rhenium, rhenium and tungsten alloy, and group 5b and 6b crucibles or molds from included ingots and castings comprised of oxide crystals including YAG and YAG based crystals, garnets, corundum crystals, and ceramic oxides. A mixture of potassium hydroxide and 15 to 90 weight percent of potassium nitrate is prepared and maintained at a temperature above melting and below the lower of 500 degrees centigrade or the temperature of decomposition of the mixture. The enveloping metal container together with its included oxide crystal object is rotated within the heated $KOH-KNO_3$ mixture, until the container is safely chemically machined away from the included oxide crystal object.

127 **High strength uranium-tungsten alloys.** Dunn, P.S.; Sheinberg, H.; Hogan, B.M.; Lewis, H.D.; Dickinson, J.M. To Dept. of Energy, Washington, DC (United States). USA Patent 5,035,854/A/. 30 Jul 1991. Filed date 2 Apr 1990. USA Patent patent application 7-502,958. Int. Cl. C22C 43/00. 2p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes alloys of uranium and tungsten and a method for making the alloys. The amount of tungsten present in the alloys is from about 4 wt % to about 35 wt %. Tungsten particles are dispersed throughout the uranium and a small amount of tungsten is dissolved in the uranium.

128 **Pre-resistance-welding resistance check.** Deste fan, D.E.; Stompro, D.A. To Dept. of Energy, Washington, DC (USA). USA Patent 5,021,625/A/. 4 Jun 1991. Filed date 8 Jun 1989. USA Patent patent application 7-362,990. Int. Cl. B23K 11/25. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a preweld resistance check for resistance welding machines using an open circuited measurement to determine the welding machine resistance, a closed circuit measurement to determine the parallel resistance of a workpiece set and the machine, and a calculation to determine the resistance of the workpiece set. Any variation in workpiece set or machine resistance is an indication that the weld may be different from a control weld.

129 **Process for alloying uranium and niobium.** Holcombe, C.E.; Northcutt, W.G.; Masters, D.R.; Chapman, L.R. To US DOE, Washington, DC (USA). USA Patent 5,006,306/A/. 9 Apr 1991. Filed date 6 Sep 1990. USA Patent patent application 7-578,154. Int. Cl. C22C 45/00. 2p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes alloys such as U-6Nb prepared by forming a stacked sandwich array of uranium sheets and niobium powder disposed in layers between the sheets, heating the array in a vacuum induction melting furnace to a temperature such as to melt the uranium, holding the resulting mixture at a temperature above the melting point of uranium until the niobium dissolves in the uranium, and casting the uranium-niobium solution. Compositional uniformity in the alloy product is enabled by use of the sandwich structure of uranium sheets and niobium powder.

130 **Apparatus and process for the electrolytic reduction of uranium and plutonium oxides.** Poa, D.S.; Burris, L.; Steunenberg, R.K.; Tomezuk, Z. To Dept. of Energy, Washington, DC (USA). USA Patent 4,995,948/A/. 26 Feb 1991. Filed date 24 Jul 1989. USA Patent patent application 7-384,195. Int. Cl. C25C 3/00. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an apparatus and process for reducing uranium and/or plutonium oxides to produce a solid, high-purity metal. The apparatus is an electrolyte cell consisting of a first container, and a smaller second container within the first container. An electrolyte fills both containers, the level of the electrolyte in the first container being above the top of the second container so that the electrolyte

can be circulated between the containers. The anode is positioned in the first container while the cathode is located in the second container. Means are provided for passing an inert gas into the electrolyte near the lower end of the anode to sparge the electrolyte and to remove gases which form on the anode during the reduction operation. Means are also provided for mixing and stirring the electrolyte in the first container to solubilize the metal oxide in the electrolyte and to transport the electrolyte containing dissolved oxide into contact with the cathode in the second container.

131 **Molten metal feed system controlled with a traveling magnetic field.** Praeg, W.F. To Dept. of Energy, Washington, DC (USA). USA Patent 4,993,477/A/. 19 Feb 1991. Filed date 6 Mar 1989. USA Patent patent application 7-318,875. Int. Cl. B22D 11/10. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a continuous metal casting system in which the feed of molten metal controlled by means of a linear induction motor capable of producing a magnetic traveling wave in a duct that connects a reservoir of molten metal to a caster. The linear induction motor produces a traveling magnetic wave in the duct in opposition to the pressure exerted by the head of molten metal in the reservoir.

132 **Method and device for controlling plume during laser welding.** Fuerschbach, P.W.; Jellison, J.L.; Keicher, D.M.; Oberkampf, W.L. To Dept. of Energy, Washington, DC (USA). USA Patent 4,992,643/A/. 12 Feb 1991. Filed date 25 Aug 1989. USA Patent patent application 7-398,577. Int. Cl. B23K 26/00. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a method and apparatus for enhancing the weldment of a laser welding system. The laser weld plume control device includes a cylindrical body defining an upside-down cone cavity; the upper surface of the body circumscribes the base of the cone cavity, and the vertex of the cone cavity forms an orifice concentrically located with respect to the laser beam and the plume which forms as a result of the welding operation. According to the method of the invention, gas is directed radially inward through inlets in the upper surface of the body into and through channels in the wall of the body and finally through the orifice of the body, and downward onto the surface of the weldment.

133 **Uranium-titanium-niobium alloy.** Ludtka, G.M. To US Dept. of Energy, Washington, DC (USA). USA Patent 4,968,482/A/. 6 Nov 1990. Filed date 23 Feb 1990. USA Patent patent application 7-483,683. Int. Cl. C22C 43/00. 2p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a uranium alloy having small additions of Ti and Nb. It shows improved strength and ductility in cross-section of greater than one inch over prior uranium alloy having only Ti as an alloy element.

134 **High energy product permanent magnet having improved intrinsic coercivity and method of making same.** Ramesh, R.; Thomas, G. To US Dept of Energy, Washington, DC (USA). USA Patent 4,968,347/A/. 6 Nov 1990. Filed date 22 Nov 1988. USA Patent patent application 7-274,875. Int. Cl. C22C 29/14. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a high energy rare earth-ferromagnetic metal permanent magnet which is characterized by improved intrinsic coercivity and is made by forming a particulate mixture of a permanent magnet alloy. It comprises: one or more rare earth elements and one or more ferromagnetic metals and forming a second particulate mixture of a sintering alloy consisting essentially of 92–98 wt. % of one or more rare earth elements selected from the class consisting of Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, and mixtures of two or more of such rare earth elements, and 2–8 wt. % of one or more alloying metals selected from the class consisting of Al, Nb, Zr, V, Ta, Mo, and mixtures of two or more of such metals. The permanent magnet alloy particles and sintering aid alloy are mixed together and magnetically oriented by immersing the mixture in an axially aligned magnetic field while cold pressing the mixture. The compressed mixture is then sintered at a temperature above the melting point of the sintering aid and below the melting point of the permanent magnet alloy to thereby coat the particle surfaces of the permanent magnetic alloy particles with the sintering aid while inhibiting migration of the rare earth element in the sintering aid into the permanent magnet alloy particles to thereby raise the intrinsic coercivity of the permanent magnet alloy without substantially lowering the high energy of the permanent magnet alloy.

3602 Ceramics, Cermets, and Refractories

Refer also to citation(s) 35, 71, 158

135 **Superconductors and process for making superconductors.** Aselage, T.L.; Keefer, K.D. To Dept. of Energy. 31 Aug 1988. USA Patent patent application 7-238,448. 20p. Sponsored by USDOE, Washington. DC (United States). DOE Contract AC04-76DP00789. Order Number DE91017336. Source: OSTI; NTIS; GPO Dep.

A process for forming thin films of superconducting material on a metal substrate by heating the metal substrate in an oxidizing atmosphere to form a metal oxide on the substrate surface and then coating the surface of the substrate with a solution containing dissolved salts of the metals which make up the superconducting film. The solution on the substrate is heated to evaporate the solvent and form a film of salts on the substrate surface. The dried film is further heated at an elevated temperature, either in the presence or absence of O_2, to complete reaction between constituents of the film. The resulting ceramic coated substrate is finally heated in an oxidizing atmosphere to form a superconducting film on the substrate.

136 **Superconducting thin films on potassium tantalate substrates.** Feenstra, R.; Boatner, L.A. To Dept. of Energy. 10 Nov 1988. USA Patent patent application 7-269,410. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE91016849. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A superconducting system for the lossless transmission of electrical current comprising a thin film of superconducting material $Y_1Ba_2Cu_3O_{7-x}$ epitaxially deposited upon a $KTaO_3$ substrate. The $KTaO_3$ is an improved substrate over those of the prior art since it exhibits small lattice constant mismatch and does not chemically react with the superconducting film. 2 figs.

137 Detection of surface impurity phases in high-T_c superconductors using thermally stimulated luminescence. Cooke, D.W.; Jahan, M.S. To Dept. of Energy. 23 Nov 1988. USA Patent patent application 7-276,188. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE91016854. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Detection of surface impurity phases in high-temperature superconducting materials. Thermally stimulated luminescence has been found to occur in insulating impurity phases which commonly exist in high-temperature superconducting materials. The present invention is sensitive to impurity phases occurring at a level of less than 1% with a probe depth of about 1 um which is the region interest for many superconductivity applications. Spectroscopic and spatial resolution of the emitted light from a sample permits identification and location of the impurity species. Absence of luminescence, and thus of insulating phases, can be correlated with low values of rf surface resistance. 5 figs.

138 Li_2O-Al_2O_3-SiO_2 glass ceramic-aluminum containing austenitic stainless steel composite body and a method of producing the same. Cassidy, R.T. To Dept. of Energy. 9 Dec 1988. USA Patent patent application 7-281,729. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00053. Order Number DE91016858. Source: OSTI; NTIS; GPO Dep.

The present invention relates to a hermetically sealed Li_2O-Al_2O_3-SiO_2 glass ceramic-aluminum containing stainless steel composite body and a method of producing the body. The composite body includes an oxide interfacial region between the glass ceramic and metal, wherein the interfacial region consists essentially of an Al_2O_3 layer. The interfacial Al_2O_3 region includes constituents of both the metal and glass ceramic. 8 figs.

139 Composite for superconducting metal oxide. Singh, Jitendra P.; Shi, Donglu; Capone, D.W. II; Dusek, J.T. To Dept. of Energy. 23 Dec 1988. USA Patent patent application 7-289,287. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE91016861. Source: OSTI; NTIS; GPO Dep.

A principal objective of the invention is to provide a new superconducting composite which has a greatly improved ductility and fracture resistance to assist in the fabrication and processing of superconductors and to provide long service life. A principal objective of the present invention is to provide a composite superconductor comprising a continuous superconductor phase and a minor amount of silver present as a discontinuous phase.

140 Method for forming metallic silicide films on silicon substrates by ion beam deposition. Zuhr, R.A.; Holland, O.W. To Dept. of Energy. 24 Jan 1989. USA Patent patent application 7-300,863. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE91016888. Source: OSTI; NTIS; GPO Dep.

Metallic silicide films are formed on silicon substrates by contacting the substrates with a low-energy ion beam of metal ions while moderately heating the substrate. The heating of the substrate provides for the diffusion of silicon atoms through the film as it is being formed to the surface of the film for interaction with the metal ions as they contact the diffused silicon. The metallic silicide films provided by the present invention are contaminant free, of uniform stoichiometry, large grain size, and exhibit low resistivity values which are of particular usefulness for integrated circuit production.

141 Plenum type crystal growth chamber. Montgomery, K.E. To Dept. of Energy. 1990. Filed date 30 Oct 1989. USA Patent patent application 7-428,536. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE92003831. Source: OSTI; NTIS; GPO Dep.

Crystals are grown in a tank which is divided by a baffle into a crystal growth region above the baffle and a plenum region below the baffle. A turbine blade or stirring wheel is positioned in a turbine tube which extends through the baffle to generate a flow of solution from the crystal growing region to the plenum region. The solution is pressurized as it flows into the plenum region. The pressurized solution flows back to the crystal growing region through return flow tubes extending through the baffle. Growing crystals are positioned near the ends of the return flow tubes to receive a direct flow of solution.

142 Low density metal hydride foams. Maienschein, J.L.; Barry, P.E. To Dept. of Energy. 1990. Filed date 31 May 1990. USA Patent patent application 7-531,363. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE92003729. Source: OSTI; NTIS; GPO Dep.

Disclosed is a low density foam having a porosity of from 0 to 98% and a density less than about 0.67 gm/cc, prepared by heating a mixture of powdered lithium hydride and beryllium hydride in an inert atmosphere at a temperature ranging from about 455 to about 490 K for a period of time sufficient to cause foaming of said mixture, and cooling the foam thus produced. Also disclosed is the process of making the foam. 6 figs.

143 A method for joining ceramic shapes. Rabin, B.H. To Dept. of Energy. 1990. Filed date 26 Jun 1990. USA Patent patent application 7-543,897. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE92003815. Source: OSTI; NTIS; GPO Dep.

The invention is a method for joining shapes of ceramic materials together to form a unitary ceramic structure. In the method of the invention, a mixture of two or more chemical components which will react exothermically is placed between the surfaces to be joined, and the joined shapes heated to a temperature sufficient to initiate the

exothermic reaction forming a joining material which acts to bond the shapes together. Reaction materials are chosen which will react exothermically at temperatures below the degradation temperature of the materials to be joined. The process is particularly suited for joining composite materials of the silicon carbide-silicon carbide fiber type.

144 Precursors in the preparation of transition metal nitrides and transition metal carbonitrides and their reaction intermediates. Maya, L. To Dept. of Energy, Washington, DC (United States). USA Patent 5,023,213/A/. 11 Jun 1991. Filed date 9 Dec 1986. USA Patent patent application 7-939,920. Int. Cl. C01B 35/58. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a composition comprising: a transition metal bound to; a first ligand selected from the group inorganic amide and imide ligands; and a second ligand being acetylide ligands. This patent also describes a process for making ceramics comprising: pyrolyzing the precursor in an inert atmosphere.

145 Combustion synthesis of boride and other composites. Halverson, D.C.; Lum, B.Y.; Munir, Z.A. To Dept. of Energy, Washington, DC (USA). USA Patent 4,879,262/A/. 7 Nov 1989. Filed date 28 Jul 1988. USA Patent Application 7-225,413. Int. Cl. C04G 35/52. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a combustion synthesis method of forming B_4C rich B_4C/TiB_2 composites. It comprises: forming a powder compact of powdered B, C and Ti, or oxides thereof, or hydrides thereof, or mixtures thereof in ratios which produce a B_4C rich composite of selected B_4C/TiB_2 mole ratio; preheating the powder compact to a predetermined initial temperature prior to combustion, the temperature being determined by the selected B_4C/TiB_2 mole ratio; producing a self-propagating combustion wave in the powder compact to produce a B_4C/TiB_2 composite of the selected B_4C rich mole ratio.

146 Long-laser-pulse method of producing thin films. Balooch, M.; Olander, D.K.; Russo, R.E. To US DOE, Washington, DC (United States). USA Patent 5,019,552/A/. 28 May 1991. Filed date 20 Feb 1990. USA Patent patent application 7-482,131. Int. Cl. B05D 3/06. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This paper describes a method of depositing thin films by means of laser vaporization which employs a long-pulse laser (Nd-glass of about one millisecond duration) with a peak power density typically in the range 10^5–10^6 W/cm^2. The method may be used to produce high T_c superconducting films of perovskite material. In one embodiment, a few hundred nanometers thick film of $YBa_2Cu_3O_{7-x}$ is produced on a $SrTiO_3$ crystal substrate in one or two pulses. In situ-recrystallization and post-annealing, both at elevated temperature and in the presence of an oxidizing agent help to improve film quality. The film thickness exhibits a $\cos\theta$ dependence with the vapor emission angle, and the film composition is independent of this angle.

147 Method for the preparation of thallium-containing superconducting materials by precipitation. Bunker, B.C.; Lamppa, D.L.; Voigt, J.A. To US DOE, Washington, DC (USA). USA Patent 5,001,107/A/. 19 Mar 1991. Filed date 2 Aug 1989. USA Patent patent application 7-388,429. Int. Cl. C01F 11/02. 6p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes improved methods for the preparation of precursor powders that are useu in the preparation of superconducting ceramic materials that contain thallium. A first solution that contains the hydrogen peroxide and metal cations, other than thallium, that will be part of the ceramic is quickly mixed with a second solution that contains precipitating anions and thallium (I) to form a precipitate which is dried to yield precursor powders. The precursor powders are calcined an sintered to produce superconducting materials that contain thallium.

3606 Other Materials

Refer also to citation(s) 20, 31, 32, 53, 122, 164, 165, 170, 205, 215

148 Frequency doubling crystals. Wang, F.; Velsko, S.P. To Dept. of Energy. 15 Aug 1988. USA Patent patent application 7-232,200. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE91017327. Source: OSTI; NTIS; GPO Dep.

A systematic approach to the production of frequency conversion crystals is described in which a chiral molecule has attached to it a "harmonic generating unit" which contributes to the noncentrosymmetry of the molecule. Certain preferred embodiments of such harmonic generating units include carboxylate, guanadyly and imidazolyl units. Certain preferred crystals include L-arginine fluoride, deuterated L-arginine fluoride, L-arginine chloride monohydrate, L-arginine acetate, dithallium tartrate, ammonium N-acetyl valine, N-acetyl tyrosine and N-acetyle hydroxyyproline. Chemical modifications of the chiral molecule, such as deuteration, halogenation and controlled counterion substitution are available to adapt the dispersive properties of a crystal in a particular wavelength region.

149 Controlled ion implant damage profile for etching. Arnold, G.W. Jr.; Ashby, C.I.H.; Brannon, P.J. To Dept. of Energy. 18 Aug 1988. USA Patent patent application 7-233,511. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE91017328. Source: OSTI; NTIS; GPO Dep.

This invention pertains to a process for etching a material such as $LiNbO_3$ by implanting ions having a plurality of different kinetic energies in an area to be etched, and then contacting the ion implanted area with an etchant. The various energies of the ions are selected to produce implant damage substantially uniformly throughout the entire depth of the zone to be etched, thus tailoring the vertical profile of the damaged zone.

150 Oriented silicon wafer latch accelerometer (110). Ciarlo, D.R. To Dept. of Energy. 29 Sep 1988. USA Patent patent application 7-250,591. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

W-7405-ENG-48. Order Number DE91017326. Source: OSTI; NTIS; GPO Dep.

A method for etching a (110) silicon wafer to produce latching cantilever beams, which bend parallel to the surface of the wafer. The resulting apparatus is also part of the invention. 6 figs.

151 Improved substrate structures for InP-based devices. Wanlass, M.; Sheldon, P. To Dept. of Energy. 30 Sep 1988. USA Patent patent application 7-251,484. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE91017349. Source: OSTI; NTIS; GPO Dep.

A substrate structure for an InP-based semiconductor device having an InP-based film is disclosed. The substrate structure includes a substrate region having a light-weight bulk substrate and an upper GaAs layer. An interconnecting region is disposed between the substrate region and the InP-based device. The interconnecting region includes a compositionally graded intermediate layer substantially lattice matched at its one end to the GaAs layer and substantially lattice matched at its opposite end to the InP-based film. The interconnecting region further includes a dislocation mechanism disposed between the GaAs layer and the InP-based film in cooperation with the graded intermediate layer, the buffer mechanism blocking and inhibiting propagation of threading dislocations between the substrate region and the InP-based device. 1 fig.

152 Phenolic dyes as nonbleachable absorbers compatible with novolac resins for linewidth control in photoresists. Renschler, C.L. To Dept. of Energy. 17 Oct 1988. USA Patent patent application 7-258,543. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE91016973. Source: OSTI; NTIS; GPO Dep.

Photoresist techniques and compositions are provided employing curcumin as an absorptive dye for the purpose of reducing linewidth non-uniformity caused by scattered and reflective light from the substrate-resist interface. The photoresist compositions containing curcumin as the absorptive dye are used in the production of microelectronic circuitry by both single layer and multilayer photoresist techniques. 2 figs.

153 Dense, finely grained composite materials. Dunmead, S.D.; Holt, J.B.; Kingman, D.D.; Munir, Z.A. To Dept. of Energy. 21 Oct 1988. USA Patent patent application 7-260,757. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE91016978. Source: OSTI; NTIS; GPO Dep.

Dense, finely grained composite materials comprising one or more ceramic phase or phase and one or more metallic and/or intermetallic phase or phases are produced by combustion synthesis. Spherical ceramic grains are homogeneously dispersed within the matrix. Methods are provided, which include the step of applying mechanical pressure during or immediately after ignition, by which the microstructures in the resulting composites can be controllably selected. 10 figs.

154 Strong liquid-crystalline polymeric compositions. Dowell, F. To Dept. of Energy. 28 Nov 1988. USA Patent patent application 7-277,085. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE91016855. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Strong liquid-crystalline polymeric (LCP) compositions of matter. LCP backbones are combined with liquid crystalline (LC) side chains in a manner which maximizes molecular ordering through interdigitation of the side chains, thereby yielding materials which are predicted to have superior mechanical properties over existing LCPs. The theoretical design of LCPs having such characteristics includes consideration of the spacing distance between side chains along the backbone, the need for rigid sections in the backbone and in the side chains, the degree of polymerization, the length of the side chains, the regularity of the spacing of the side chains along the backbone, the interdigitation of side chains in sub-molecular strips, the packing of the side chains on one or two sides of the backbone to which they are attached, the symmetry of the side chains, the points of attachment of the side chains to the backbone, the flexibility and size of the chemical group connecting each side chain to the backbone, the effect of semiflexible sections in the backbone and side chains, and the choice of types of dipolar and/or hydrogen bounding forces in the backbones and the side chains for easy alignment. 16 refs., 4 tabs.

155 Cermet materials prepared by combustion synthesis and metal infiltration. Holt, J.B.; Dunmead, S.D.; Halverson, D.C.; Landingham, R.L. To Dept. of Energy. 12 Dec 1988. USA Patent patent application 7-283,440. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE91017140. Source: OSTI; NTIS; GPO Dep.

Ceramic-metal composites (cermets) are made by a combination of self-propagating high temperature combustion synthesis and molten metal infiltration. Solid-gas, solid-solid and solid-liquid reactions of a powder compact produce a porous ceramic body which is infiltrated by molten metal to produce a composite body of higher density. AlN-Al and many other materials can be produced. 5 figs.

156 Method of passivating semiconductor surfaces. Wanlass, M. To Dept. of Energy. 14 Dec 1988. USA Patent patent application 7-284,222. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE91016859. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of a method of passivating Group 3–5 or 2–6 semiconductor compound surfaces. The method includes selecting a passivating material having a lattice constant substantially mismatched to the lattice constant of the semiconductor compound. The passivating material is then grown as an ultrathin layer of passivating material on the surface of the Group 3–5 or 2–6 semiconductor compound. The passivating material is grown to a thickness sufficient to maintain a coherent interface between the ultrathin passivating material and the semiconductor compound. In addition, a device formed from such method is also disclosed.

157 Ceramic composite coating. Wicks, G.G. To Dept. of Energy. 5 Jan 1989. USA Patent patent application 7-293,846. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE91016887. Source: OSTI; NTIS; GPO Dep.

A thin, room-temperature-curing, ceramic composite for coating and patching metal substrates comprises a sol gel silica glass matrix filled with finely ground particles or fibers, preferably alumina. The sol gel glass is made by adding ethanol to water to form a first mixture, then separately adding ethanol to tetraethyl orthosilicate to form a second mixture, then slowly adding the first to the second mixture to make a third mixture, and making a slurry by adding the finely ground particles or fibers to the third mixture. The composite can be applied by spraying, brushing or trowelling. If applied to patch fine cracks, densification of the ceramic composite may be obtained to enhance sealing by applying heat during curing.

158 Liquid crystal polyester thermosets. Benicewicz, B.C.; Hoyt, A.E. To Dept. of Energy. 1990. Filed date 4 Apr 1990. USA Patent patent application 7-504,217. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE92003838. Source: OSTI; NTIS; GPO Dep.

The present invention relates to the field of curable liquid crystal polyester monomers and to thermoset liquid crystalline polyester compositions prepared therefrom. It is an object of this invention to provide curable liquid crystalline polyester materials. Another object of this invention is to provide a process of preparing curable liquid crystal polyester monomers. Yet another object of this invention is to provide liquid crystalline blends of polyester materials. It is a further object of this invention to provide thermoset liquid crystalline polyester compositions. It is a still further object of this invention to provide thermoset liquid crystalline polyester compositions having a high heat resistance. 1 fig.

159 Diamond growth at low substrate temperatures. Hsu, W.L.; Tung, D.M. To Dept. of Energy. 1990. Filed date 24 Apr 1990. USA Patent patent application 7-513,657. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE92004604. Source: OSTI; NTIS; GPO Dep.

Diamond films are deposited on silicon wafers at a temperature of less than 600°C by a microwave plasma-assisted chemical vapor deposition process using methane in hydrogen as a source of carbon. 9 refs., 3 figs.

160 Ammonia-treated phosphate glasses useful for sealing to metals. Brow, R.K.; Day, D.E. To Dept. of Energy. 1990. Filed date 30 Apr 1990. USA Patent patent application 7-516,935. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE92004611. Source: OSTI; NTIS; GPO Dep.

A method of improving surface-dependent properties of phosphate glass such as durability and wear resistance without significantly affecting its thermal expansion coefficient is provided which comprises annealing the glass in a dry ammonia atmosphere at temperatures approximating the transition temperature of the glass. The ammonia annealing treatment of the present invention is carried out for a time sufficient to allow incorporation of a thin layer of nitrogen into the surface of the phosphate glass, and the treatment improves the durability of the glass without the reduction in the thermal expansion coefficient that has restricted the effectiveness of prior ammonia treatments. The improved phosphate glass resulting from this method is superior in wear resistance, yet maintains suitable thermal expansion properties so that it may be used effectively in a variety of applications requiring hermetic glass-metal seals.

161 Low density microcellular foams. LeMay, J.D. To Dept. of Energy. 1990. Filed date 8 Jun 1990. USA Patent patent application 7-535,007. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE92003744. Source: OSTI; NTIS; GPO Dep.

Disclosed is a process of producing microcellular from which comprises the steps of: selecting a multifunctional epoxy oligomer resin; mixing said epoxy resin with a non-reactive diluent to form a resin-diluent mixture; forming a diluent containing cross-linked epoxy gel from said resin-diluent mixture; replacing said diluent with a solvent therefore; replacing said solvent with liquid carbon dioxide; and vaporizing off said liquid carbon dioxide under supercritical conditions, whereby a foam having a density in the range of 35–150 mg/cc and cell diameters less than about 1 μm is produced. Also disclosed are the foams produced by the process.

162 High density crystalline boron prepared by hot isostatic pressing in refractory metal containers. Hoenig, C.L. To Dept. of Energy. 1990. Filed date 18 Jun 1990. USA Patent patent application 7-539,392. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE92003749. Source: OSTI; NTIS; GPO Dep.

Boron powder is hot isostatically pressed in a refractory metal container to produce a solid boron monolith with a bulk density at least 2.22 g/cc and up to greater than 2.34 g/cc. The refractory metal container is formed of tantalum, niobium, tungsten, molybdenum or alloys thereof in the form of a canister or alternatively plasma sprayed or chemical vapor deposited onto a powder compact. Hot isostatic pressing at 1800°C and 30 KSI (206.8 MPa) argon pressure for four hour produces a bulk density of 2.34 g/cc. Complex shapes can be made.

163 Phosphazene polymer containing composites and method for making phosphazene polymer containing composites. Allen, C.A.; Grey, A.E.; McCaffrey, R.R.; Simpson, B.M.; Stone, M.L. To Dept. of Energy. 1990. Filed date 30 Jul 1990. USA Patent patent application 7-559,234. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE92003826. Source: OSTI; NTIS; GPO Dep.

The object of the invention is to provide a composite material comprised of phosphazene polymer. A feature of phosphazene-containing composites is their superior stiffness, thermal stability, and hardness which is lacking in more typical composite constituents. An advantage of using

phosphazene composites is a wider range of applications, including uses in harsh environments. Another object of the present invention provides a method for producing phosphazene-containing composite materials through a pultrusion process. In brief, these and other objects are achieved by a composite produced by first coating a reinforcing material with an inorganic phosphazene compound and then polymerizing the phosphazene compound so as to confer superior thermal, physical and chemical resistance qualities to the composite. 2 figs., 6 tabs.

164 **Low density carbonized composite foams.** Kong, F.M. To Dept. of Energy, Washington, DC (United States). USA Patent 5,047,225/A/. 10 Sep 1991. Filed date 14 Mar 1990. USA Patent patent application 7-493,534. Int. Cl. D01F 9/12. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a carbonized composite foam having a density less than about 50 mg/cm^3 and individual cell sizes no greater than about 1 μm in diameter, and the process of making it.

165 **Composite foams.** Williams, J.M.; Nyitray, A.M.; Wilkerson, M.H. To Dept. of Energy, Washington, DC (United States). USA Patent 5,037,859/A/. 6 Aug 1991. Filed date 24 Aug 1990. USA Patent patent application 7-572,064. Int. Cl. C08J 9/40. 6p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes composite foams that are provided comprising a first rigid, microcellular, open-celled organic polymer foam having a density of from about 0.015 g/cm^3 to about 0.20 g/cm^3 and a pore size of from about 1 micron to about 30 microns, the first foam containing a second polymer having a density of from about 0.015 g/cm^3 to about 0.20 g/cm^3 or a second polymer foam having a density of from about 0.015 g/cm^3 to about 0.20 g/cm^3 and a pore size of from about 0.01 microns to about 1.0 micron within the open cells of the first foam.

166 **UV absorption control of thin film growth.** Biefeld, R.M.; Hebner, G.A.; Killeen, K.P.; Zuhoski, K.P. To Dept. of Energy, Washington, DC (United States). USA Patent 5,032,435/A/. 16 Jul 1991. Filed date 27 Mar 1989. USA Patent patent application 7-328,918. Int. Cl. B05D 00/00. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A system described for monitoring and controlling the rate of growth of thin films in an atmosphere of reactant gases, measures the UV absorbance of the atmosphere and calculates the partial pressure of the gases. The flow of reactant gases is controlled in response to the partial pressure.

167 **Electrochemical method for defect delineation in silicon-on-insulator wafers.** Guilinger, T.R.; Jones, H.D.T.; Kelly, M.J.; Medernach, J.W.; Stevenson, J.O.; Tsao, S.S. To US DOE, Washington, DC (USA). USA Patent 5,015,346/A/. 14 May 1991. Filed date 10 Apr 1990. USA Patent patent application 7-506,734. Int. Cl. C25F 3/00. 2p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an electrochemical method for defect delineation in thin-film SOI or SOS wafers in which a surface of a silicon wafer is electrically connected so as to control the voltage of the surface within a specified range, the silicon wafer is then contacted with an electrolyte, and, after removing the electrolyte, defects and metal contamination in the silicon wafer are identified.

168 **High expansion, lithium corrosion resistant sealing glasses.** Brow, R.K.; Watkins, R.D. To US DOE, Washington, DC (USA). USA Patent 5,015,530/A/. 14 May 1991. Filed date 21 Jan 1988. USA Patent patent application 7-146,560. Int. Cl. B32B 15/04. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes glass compositions containing CaO, Al_2O_3,B_2O_3, SrO and BaO in various combinations of mole %. These compositions are capable of forming stable glass-to-metal seals with pin materials of 446 Stainless Steel and Alloy-52 rather than molybdenum, for use in harsh chemical environments, specifically in lithium batteries.

169 **Oxynitride glass production procedure.** Weidner, J.R.; Schuetz, S.T.; O'Brien, M.H. To US DOE, Washington, DC (USA). USA Patent 5,006,142/A/. 9 Apr 1991. Filed date 28 Mar 1990. USA Patent patent application 7-500,352. Int. Cl. C03C 3/11. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes the invention of a process for the preparation of high quality oxynitride glasses without resorting to high pressures. Nitrogen-containing compounds such as Si_3N_4 are first encapsulated in a low melting temperature glass. Particles of the encapsulated nitrogen-containing compound are mixed with other oxide glass-formers and melted in an atmosphere of flowing nitrogen and in the presence of buffering gas to form the oxynitride glass. Glasses containing up to 15 at % nitrogen have been prepared by this method.

170 **Low density, resorcinol-formaldehyde aerogels.** Pekala, R. To Dept. of Energy, Washington, DC (USA). USA Patent 4,997,804/A/. 5 Mar 1991. Filed date 12 Sep 1989. USA Patent patent application 7-406,009. Int. Cl. B01V 20/02. 7p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes the polycondensation of resorcinol with formaldehyde under alkaline conditions results in the formation of surface functionalized polymer Clusters. The covalent crosslinking of these clusters produces gels which when processed under supercritical conditions, produce low density, organic aerogels (density $\leq$ 100 mg/cc; cell size $\leq$ 0.1 microns). The aerogels are transparent, dark red in color and consist of interconnected colloidal-like particles with diameters of about 100. These aerogels may be further carbonized to form low density carbon foams with cell size of about 0.1 micron.

171 **Porous silicon formation and etching process for use in silicon micromachining.** Gui'linger, T.R.; Kelly, M.J.; Martin, S.B. Jr.; Stevenson, J.O.; Tsao, S.S. To Dept. of Energy, Washington, DC (USA). USA Patent 4,995,954/A/. 26 Feb 1991. Filed date 12 Feb 1990. USA Patent patent application 7-478,376. Int. Cl. C25F 3/12. 2p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a reproducible process for uniformly etching silicon from a series of micromechanical

structures used in electrical devices and the like providing a micromechanical structure having a silicon layer with defined areas for removal thereon and an electrochemical cell containing an aqueous hydrofluoric acid electrolyte. The micromechanical structure is submerged in the electrochemical cell and the defined areas of the silicon layer thereon are anodically biased by passing a current through the electrochemical cell for a time period sufficient to cause the defined areas of the silicon layer to become porous. The formation of the depth of the porous silicon is regulated by controlling the amount of current passing through the electrochemical cell. The micromechanical structure is then removed from the electrochemical cell and submerged in a hydroxide solution to remove the porous silicon. The process is subsequently repeated for each of the series of micromechanical structures to achieve a reproducibility better than 0.3%.

172 **Process for forming a metal compound coating on a substrate.** Sharp, D.J.; Vernon, M.E.; Wright, S.A. To Dept. of Energy, Washington, DC (USA). USA Patent 4,995,947/A/. 26 Feb 1991. Filed date 29 Jun 1988. USA Patent patent application 7-213,012. Int. Cl. C25D 15/00. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a method of coating a substrate with a thin layer of a metal compound by forming a dispersion of an electrophoretically active organic colloid and a precursor of the metal compound in an electrolytic cell in which the substrate is an electrode. Upon application of an electric potential, the electrode is coated with a mixture of the organic colloid and the precursor to the metal compound, and the coated substrate is then heated in the presence of an atmosphere or vacuum to decompose the organic colloid and form a coating of either a combination of metal compound and carbon, or optionally forming a porous metal compound coating by heating to a temperature high enough to chemically react the carbon.

173 **Low density carbonized composite foams.** Kong, F. To Dept. of Energy, Washington, DC (United States). USA Patent 4,992,254/A/. 12 Feb 1991. Filed date 7 Dec 1989. USA Patent patent application 7-447,478. Int. Cl. C01B 31/02. 6p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

In this patent a carbonized composite foam having a density less than about 50 mg/cm^3 and individual cell sizes no greater than about 1 μm in diameter is described and the process of making it.

174 **Combustion synthesis of low exothermic component rich composites.** Halverson, D.C.; Lum, B.Y.; Munir, Z.A. To Dept. of Energy, Washington, DC (USA). USA Patent 4,990,180/A/. 5 Feb 1991. Filed date 1 Sep 1989. USA Patent patent application 7-401,698. Int. Cl. C22C 29/02. 6p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a self-sustaining combustion synthesis process for producing hard, tough, lightweight, low exothermic potential product (LEPP)/high exothermic potential product (HEPP) composites based on the thermodynamic dependence of adiabatic temperature and product composition on the stoichiometry of the LEPP and HEPP reactants. For lightweight products the composition must be relatively rich in the LEPP component. LEPP rich composites are obtained by varying the initial temperature of the reactants. The product is hard, porous material whose toughness can be enhanced by filling the pores with aluminum or other metal phases using a liquid metal infiltration process. The process can be extended to the formation of other composites having a low exothermic component.

175 **Non-contact contour gage.** Bieg, L.F. To Dept. of Energy, Washington, DC (USA). USA Patent 4,977,777/A/. 18 Dec 1990. Filed date 9 Feb 1989. USA Patent patent application 7-308,074. Int. Cl. G01B 13/16. 7p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a fluid probe for measuring the surface contour of a machined part is provided whereby the machined part can remain on the matching apparatus during surface contour measurement. A measuring nozzle in a measuring probe directs a measuring fluid flow onto the surface. The measuring nozzle is on the probe situated midway between two guide nozzles that direct guide fluid flows onto the surface. When the guide fluid flows interact with the surface, they cause the measuring flow and measuring probe to be oriented perpendicular to the surface. The measuring probe includes a pressure chamber whose pressure is monitored. As the measuring fluid flow encounters changes in surface contour, pressure changes occur in the pressure chamber. The surface contour is represented as data corresponding to pressure changes in the pressure chamber as the surface is scanned.

40 CHEMISTRY

4001 Analytical and Separations Chemistry

Refer also to citation(s) 11, 14, 16, 19, 20, 140, 142, 204, 217, 220, 235

176 **Solvent composition and process for the isolation of radium.** McDowell, W.J.; Case, G.N. To Dept. of Energy. 5 Oct 1988. USA Patent patent application 7-253,634. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE91017352. Source: OSTI; NTIS; GPO Dep.

A solvent extraction composition for radium including a high molecular weight organophilic carboxylic acid and an organophilic macrocycle dissolved in a suitable solvent. 2 figs.

177 **Method of separating organic contaminants from fluid feedstreams with polyphosphazene membranes.** McCaffrey, R.R.; Cummings, D.G. To Dept. of Energy. 1990. Filed date 30 Apr 1990. USA Patent patent application 7-516,400. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE92004607. Source: OSTI; NTIS; GPO Dep.

A method is provided for separating polar hydrocarbons from a fluid feedstream. The fluid feedstream is flowed

across a first surface of a polyphosphazene semipermeable membrane. At least one polar hydrocarbon from the fluid feedstream permeates through the polyphosphazene semipermeable membrane to a second opposed surface of the semipermeable membrane. Then the permeated polar hydrocarbon is removed from the second opposed surface of the polyphosphazene semipermeable membrane. Outstanding and unexpected separation selectivities on the order of 10,000 were obtained for methylene chloride when a methylene chloride in water feedstream was flowed across the polyphosphazene semipermeable membrane in the invented method.

178 **Apparatus and method for separating constituents.** Maronde, C.P.; Killmeyer, R.P. Jr. To Dept. of Energy. 1990. Filed date 25 Jun 1990. USA Patent patent application 7-542,604. 25p. Sponsored by USDOE, Washington, DC (United States). Order Number DE92003814. Source: OSTI; NTIS; GPO Dep.

A centrifugal separator apparatus and method for improving the efficiency of the separation of constituents in a fluid stream. A cyclone separator includes an assembly for separately discharging both constituents through the same end of the separator housing. A rotary separator includes a rotary housing having a baffle disposed therein for minimizing the differential rotational velocities of the constituents in the housing, thereby decreasing turbulence, and increasing efficiency. The intensity of the centrifugal force and the time which the constituents reside within the housing can be independently controlled to improve efficiency of separation. 4 figs.

4002 Inorganic, Organic, and Physical Chemistry

Refer also to citation(s) 28, 29, 60, 67, 114, 115, 180, 185, 227, 239

179 **Polymerizable 2(2-hydroxynaphthyl) 2H-benzotriazole compounds.** Gomez, P.M.; Neidlinger, H.H. To Dept. of Energy. 1990. Filed date 21 May 1990. USA Patent patent application 7-525,572. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE92004618. Source: OSTI; NTIS; GPO Dep.

It is an object of the invention to provide benzotriazole compounds as a basis for novel polymeric ultraviolet absorbers having higher wavelength cutoffs of up to about 430nm. Particular ultraviolet absorbers are 2(2-Hydroxynaphthyl) 2H-Benzotriazole compounds having polymerizable unsaturated groups attached to the naphthyl double ring. A further object of the invention is to provide 2(2-Hydroxynaphthyl) 2H-Benzotriazole compounds having polymerizable unsaturated groups on the napthyl ring which can be homopolymerized or copolymerized with a comonomer to obtain polymeric ultraviolet absorbers having high wavelength cutoffs of up to about 430nm. 4 figs.

180 **Nonaqueous polypyrrole colloids.** Armes, S.P.; Aldissi, M. To Dept. of Energy, Washington, DC (USA). USA Patent 5,021,193/A/. 4 Jun 1991. Filed date 30 Jun 1989. USA Patent patent application 7-373,533. Int. Cl. H01B 1/06. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes processable conductive polymers including an oxidized, polymerized aromatic heterocyclic monomer, e.g., pyrrole, a stabilizing effective amount of a poly(-vinyl acetate) and dopant anions, and a process of preparing the processable conductive polymers directly in a nonaqueous medium such as methyl acetate, methyl formate, ethyl formate, and propyl formate are disclosed.

4004 Electrochemistry

Refer also to citation(s) 17, 75, 112, 116

4005 Photochemistry

Refer also to citation(s) 30

4007 Radiochemistry and Nuclear Chemistry

Refer also to citation(s) 241, 242

181 **Radiohalogenated thienylethylamine derivatives for evaluating local cerebral blood flow.** Goodman, M.M.; Knapp, F.F. Jr. To Department of Energy. 22 Dec 1988. USA Patent patent application 7-288,349. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE91016860. Source: OSTI; NTIS; GPO Dep.

An improved method of chemical synthesis of radiohalogenated thienylethylamine derivatives useful in brain imaging is described. These 5-halo-thiophene-2-isopropyl amines readily cross the blood- brain barrier and are retained in the brain for a sufficient length of time to allow evaluation of regional blood flow in the cerebrum. The advantages of the invention include a simpler synthesis route and a final compound which is less diluted with nonradioactive halogen. Use of this invention will allow clearer radioimaging or lower radiation doses to the patient, depending on the objective. 2 figs., 1 tab. (MHB)

42 ENGINEERING

Refer also to citation(s) 171

4202 Facilities, Equipment, and Techniques

Refer also to citation(s) 5, 14, 22, 38, 45, 59, 222

182 **Coaxial cable cutter.** Hall, L.C.; Hedges, R.S. To Dept. of Energy. 23 Aug 1988. USA Patent patent application 7-235,079. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE91017330. Source: OSTI; NTIS; GPO Dep.

A cutting device is provided which is useful in trimming the jackets from semi-rigid coaxial cables and wire having a cutting bit and support attached to movable jaws. A thumbpiece is provided to actuate the opening of the jaws for receiving the able to be trimmed, and a spring member is provided to actuate the closing of the jaws when thumbpiece

is released. The cutting device utilizes one moving part during the cutting operation by using a rolling cut action. The nature of the jaws allows the cutting device to work in space having clearances less than .160 inches. 3 figs.

183 Monodisperse aerosol generator. Ortiz, L.W.; Soderholm, S.C. To Dept. of Energy. 19 Sep 1988. USA Patent patent application 7-246,062. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE91017344. Source: OSTI; NTIS; GPO Dep.

An aerosol generator is described which is capable of producing a monodisperse aerosol within narrow limits utilizing an aqueous solution capable of providing a high population of seed nuclei and an organic solution having a low vapor pressure. The two solutions are cold nebulized, mixed, vaporized, and cooled. During cooling, particles of the organic vapor condense onto the excess seed nuclei, and grow to a uniform particle size.

184 A security panel with a keypad. Banks, W.W. Jr.; Uhlig, F. To Dept. of Energy. 27 Sep 1988. USA Patent patent application 7-249,814. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE91017345. Source: OSTI; NTIS; GPO Dep.

Several control panels presently use keypads to enter data. Sometimes panels require secure keypads in that they must prevent others nearby from seeing the information inputted by the keypad. The invention provides a secure keypad, which is easy to use by the user, yet is difficult for a nonuser to see. The invention places the keypad in a cavity, and provides an opening to allow access to the keypad and a window for viewing the keypad.

185 Fixture for mounting small parts for processing. Foreman, L.R.; Gomez, V.M.; Thomas, M.H. To Dept. of Energy. 29 Sep 1988. USA Patent patent application 7-250,672. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE91017348. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a fixture for mounting small parts, such as fusion target spheres or microelectronic components. A glass stalk is drawn and truncated near its tip. The truncated end of the glass stalk is dipped into silicone rubber forming an extending streamer. After the rubber cures for approximately 24 hours, a small part is touched to the streamer, and will be held securely throughout processing. 5 figs.

186 Combination drilling and skiving tool. Stone, W.J. To Dept. of Energy. 29 Sep 1988. USA Patent patent application 7-251,485. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE91017350. Source: OSTI; NTIS; GPO Dep.

This invention pertains to a combination drilling and skiving tool including a longitudinally extending hollow skiving sleeve slidably and concentrically mounted on right-handed twist drill. Dogs or pawls provided on the internal periphery of the skiving sleeve engage with the helical grooves of the drill. During a clockwise rotation of the tool, the drill moves downwardly and the sleeve translates upwardly, so that the drill performs a drilling operation on a workpiece. On the other hand, the drill moves upwardly and the sleeve translates downwardly, when the tool is rotated in a counter-clockwise direction, and the sleeve performs a skiving operation. The drilling and skiving operations are separate, independent and exclusive of each other. 5 figs.

187 Manipulator mounted transfer platform. Dobbins, J.C.; Hoover, M.A.; May, K.W.; Ross, M.J. To Dept. of Energy. 12 Oct 1988. USA Patent patent application 7-256,431. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE91017355. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a transfer platform for the conveyance of objects by a manipulator includes a bed frame and saddle clamp secured along an edge of the bed fame and adapted so as to secure the bed frame to a horizontal crosspiece of the manipulator. The platform may thus move with the manipulator in a reciprocal linear path defined by a guide rail. A bed insert may be provided for the support of conveyed objects and a lifting bail may be provided to permit the manipulator arm to install the bed frame upon the crosspiece under remote control. 5 figs.

188 Particle separator. Hendricks, C.D. To Dept. of Energy. 26 Oct 1988. USA Patent patent application 7-262,632. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE91017134. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a method and apparatus that provides for separating and classifying particles by dispersing the particles within a fluid that is upwardly flowing within a cone-shaped pipe that has its large end above its small end. Particles of similar size and shape migrate to individual levels within the flowing fluid. As the fluid is deflected by a plate at the top end of the pipe, the smallest particles are collected on a shelf-like flange. Ever larger particles are collected as the flow rate of the fluid is increased. To prevent particle sticking on the walls of the pipe, additional fluid is caused to flow into the pipe through holes that are specifically provided for that purpose. Sticking is further prevented by high frequency vibrators that are positioned on the apparatus. 1 fig.

189 System and method for exchanging tools and end effectors on a robot. Burry, D.B.; Williams, P.M. To Dept. of Energy. 1990. Filed date 2 Apr 1990. USA Patent patent application 7-502,962. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. Order Number DE92003836. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a system and method for exchanging tools and effectors on a robot permits exchange during a programmed task. The exchange mechanism is located off the robot, thus reducing the mass of the robot arm and permitting smaller robots to perform designated tasks. A simple spring/collet mechanism mounted on the robot is used which permits the engagement and disengagement of the tool or end effector without the need for a rotational orientation of the tool to the end effector/collet interface. As the tool changing system is not located on the robot arm no umbilical cords are located on robot.

190 Conduit grinding apparatus. Nachbar, H.D.; Korytkowski, A.S. To Dept. of Energy. 1990. Filed date 3 Apr 1990. USA Patent patent application 7-504,152. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC12-76SN00052. Order Number DE92003837. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a grinding apparatus for grinding the interior portion of a valve stem receiving area of a valve. The apparatus comprises a faceplate, a plurality of cams mounted to an interior face of the faceplate, a locking bolt to lock the faceplate at a predetermined position on the valve, a movable grinder and a guide tube for positioning an optical viewer proximate the area to be grinded. The apparatus can either be rotated about the valve for grinding an area of the inner diameter of a valve stem receiving area or locked at a predetermined position to grind a specific point in the receiving area.

191 Precision wire feeder for small diameter wire. Brandon, E.D.; Hooper, F.M.; Reichenbach, M.L. To Dept. of Energy. 1990. Filed date 9 Apr 1990. USA Patent patent application 7-506,126. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE92003842. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a device for feeding small diameter wire having a diameter less than .04 mm (16 mil) to a welding station which includes a driving wheel for controllably applying a non-deforming driving force to the wire to move the free end of the wire towards the welding station; and a tension device such as a torque motor for constantly applying a reverse force to the wire in opposition to the driving force to keep the wire taut. 1 fig.

192 Hot cell examination table. Gaal, P.S.; Ebjer, L.P.; Kareis, J.H.; Schlegel, G.L. To Dept. of Energy. 1990. Filed date 27 Apr 1990. USA Patent patent application 7-515,307. 15p. Sponsored by National Aeronautics and Space Administration, Washington, DC (United States). Contract N00024-79C-4026. Order Number DE92004605. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a table for use in a hot cell or similar controlled environment for use in examining specimens. The table has a movable table top that can be moved relative to a table frame. A shaft is fixedly mounted to the frame for axial rotation. A shaft traveler having a plurality of tilted rollers biased against the shaft is connected to the table top such that rotation of the shaft causes the shaft traveler to roll along the shaft. An electromagnetic drive is connected to the shaft and the frame for controllably rotating the shaft.

193 Automatic feed system for ultrasonic machining. Calkins, N.C. To Dept. of Energy. 1990. Filed date 11 May 1990. USA Patent patent application 7-522,016. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE92004614. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a method and apparatus for ultrasonic machining in which feeding of a tool assembly holding a machining tool toward a workpiece is accomplished automatically. In ultrasonic machining, a tool located just above a workpiece and vibrating in a vertical direction imparts vertical movement to particles of abrasive material which then remove material from the workpiece. The tool does not contact the workpiece. Apparatus for moving the tool assembly vertically is provided such that it operates with a relatively small amount of friction. Adjustable counterbalance means is provided which allows the tool to be immobilized in its vertical travel. A downward force, termed overbalance force, is applied to the tool assembly. The overbalance force causes the tool to move toward the workpiece is material is removed from the workpiece.

194 Valve stem and packing assembly. Wordin, J.J. To Dept. of Energy. 1990. Filed date 31 May 1990. USA Patent patent application 7-531,487. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE92003777. Source: OSTI; NTIS; GPO Dep.

A valve stem and packing assembly is provided in which a rotatable valve stem includes a first tractrix surface for sliding contact with a stem packing and also includes a second tractrix surface for sliding contact with a bonnet. Force is applied by means of a spring, gland flange, and gland on the stem packing so the stem packing seals to the valve stem and bonnet. This configuration serves to create and maintain a reliable seal between the stem packing and the valve stem. The bonnet includes a second complementary tractrix surface for contacting the second sliding tractrix surface, the combination serving as a journal bearing for the entire valve stem and packing assembly. The journal bearing so configured is known as a Schiele's pivot. The Schiele's pivot also serves to maintain proper alignment of the valve stem with respect to the bonnet. Vertical wear between the surfaces of the Schiele's pivot is uniform at all points of contact between the second sliding tractrix surface and the second complementary tractrix surface of a bonnet. The valve stem is connected to a valve plug by means of a slip joint. The valve is opened and closed by rotating the valve stem. The slip joint compensates for wear on the Schiele's pivot and on the valve plug. A ledge is provided on the valve bonnet for the retaining nut to bear against. The ledge prevents overtightening of the retaining nut and the resulting excessive friction between stem and stem packing.

195 Method and apparatus for continuous flow injection extraction analysis. Harkenstein, S.D.; Siemer, D.D. To Dept. of Energy. 1990. Filed date 8 Jun 1990. USA Patent patent application 7-534,897. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE92003743. Source: OSTI; NTIS; GPO Dep.

A method and apparatus for a continuous flow injection batch extraction analysis system is disclosed employing extraction of a component of a first liquid into a second liquid which is a solvent for a component of the first liquid, and is immiscible with the first liquid, and for separating the first liquid from the second liquid subsequent to extraction of the component of the first liquid. 1 fig.

196 Robot arm apparatus. Nachbar, H.D. To Dept. of Energy. 1990. Filed date 2 Jul 1990. USA Patent patent

application 7-546,827. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC12-76SN00052. Order Number DE92003817. Source: OSTI; NTIS; GPO Dep.

A robot arm apparatus is provided for inspecting and/or maintaining an interior of a steam generator which has an outside wall and a port for accessing the interior of the steam generator. The robot arm apparatus includes a flexible movable conduit for conveying inspection and/or maintenance apparatus from outside the steam generator to the interior of the steam generator. The flexible conduit has a terminal working end which is translated into and around the interior of the steam generator. Three motors located outside the steam generator are employed for moving the terminal working end inside the steam generator in "x," "y," and "z" directions, respectively. Commonly conducted inspection and maintenance operations include visual inspection for damaged areas, water jet lancing for cleaning sludge deposits, core boring for obtaining sludge deposits, and scrubbing of internal parts.

197 **A method and apparatus for continuous electrophoresis.** Watson, J.S. To Dept. of Energy. 1990. Filed date 10 Jul 1990. USA Patent patent application 7-551,387. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE92003822. Source: OSTI; NTIS; GPO Dep.

A method and apparatus for conducting continuous separation of substances by electrophoresis are disclosed. The process involves electrophoretic separation combined with couette flow in a thin volume defined by opposing surfaces. By alternating the polarity of the applied potential and producing reciprocating short rotations of at least on of the surfaces relative to the other, small increments of separation accumulate to cause substantial, useful segregation of electrophoretically separable components in a continuous flow system.

198 **Functional relationship-based alarm processing system.** Corsberg, D.R. To Dept. of Energy, Washington, DC (USA). USA Patent 4,812,819/A/. 14 Mar 1991. Filed date 22 Apr 1988. USA Patent patent application 7-184,927. Int. Cl. G08B 23/00. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a functional relationship-based alarm processing system and method which analyzes each alarm as it is activated and determines its relative importance with other currently activated alarms and signals in accordance with the functional relationships that the newly activated alarm has with other currently activated alarms. Once the initial level of importance of the alarm has been determined, that alarm is again evaluated if another related alarm is activated or deactivated. Thus, each alarm's importance is continuously updated as the state of the process changes during a scenario.

199 **Quick-sealing design for radiological containment.** Rampdla, D.S.; Speer, E. To Dept. of Energy, Washington, DC (United States). USA Patent 5,062,186/A/. 5 Nov 1991. Filed date 30 Jan 1990. USA Patent patent application 7-469,652. Int. Cl. A44B 19/32. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a quick-sealing assembly and method for forming an adhesive seal on opposite sides of a mechanical seal for a flexible containment bag of the type used for working with radioactively contaminated objects. The assembly includes an elongated mechanical fastener having opposing engaging members affixed at a predetermined distance from each of the elongated edges, with an adhesive layer formed between the mechanical fastener and the elongated edge such that upon engagement of the mechanical fastener and adhesive layers to opposing containment fabric, a neat triple hermetic seal is formed.

200 **Specimen coordinate automated measuring machine/fiducial automated measuring machine.** Hedglen, R.E.; Jacket, H.S.; Schwartz, A.I. To Dept. of Energy, Washington, DC (United States). USA Patent 5,050,112/A/. 17 Sep 1991. Filed date 2 Aug 1989. USA Patent patent application 7-390,852. Int. Cl. G01B 5/03. 7p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes the Specimen Coordinate Automated Measuring Machine (SCAMM) and the Fiducial Automated Measuring Machine (FAMM), a computer controlled metrology system capable of measuring length, width, and thickness, and of locating fiducial marks. SCAMM and FAMM have many similarities in their designs, and they can be converted from one to the other without taking them out of the hot cell. Both have means for: supporting a plurality of samples and a standard; controlling the movement of the samples in the +/− X and Y directions; determining the coordinates of the sample; compensating for temperature effects; and verifying the accuracy of the measurements and repeating as necessary. SCAMM and FAMM are designed to be used in hot cells.

201 **Collar nut and thrust ring.** Lowery, G.B. To Dept. of Energy, Washington, DC (United States). USA Patent 5,039,114/A/. 13 Aug 1991. Filed date 20 Apr 1989. USA Patent patent application 7-340,824. Int. Cl. F16J 15/26. 2p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A collar nut comprises a hollow cylinder having fine interior threads at one end for threadably engaging a pump mechanical seal assembly and an inwardly depending flange at the other end. The flange has an enlarged portion with a groove for receiving an O-ring for sealing against the intrusion of pumpage from the exterior. The enlarged portion engages a thrust ring about the pump shaft for crushing a hard O-ring, such as a graphite O-ring. The hard O-ring seals the interior of the mechanical seal assembly and pump housing against the loss of lubricants or leakage of pumpage. The fine threads of the hollow cylinder provide the mechanical advantage for crushing the hard O-ring evenly and easily with a hand tool from the side of the collar nut rather than by tightening a plurality of bolts from the end and streamlines the exterior surface of the mechanical seal. The collar nut avoids the spatial requirements of bolt heads at the end of a seal and associated bolt head turbulence.

202 Remote control for anode-cathode adjustment. Roose, L.D. To Dept. of Energy, Washington, DC (United States). USA Patent 5,032,717/A/. 16 Jul 1991. Filed date 4 Oct 1989. USA Patent patent application 7-417,110. Int. Cl. H01J 5/16. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

An apparatus is described for remotely adjusting he anode-cathode gap in a pulse power machine which has an electric motor located within a hollow cathode inside the vacuum chamber of the pulse power machine. Input information for controlling the motor for adjusting the anode-cathode gap is fed into the apparatus using optical waveguides. The motor, controlled by the input information, drives a worm gear that moves a cathode tip. When the motor drives in one rotational direction, the cathode is moved toward the anode and the size of the anode-cathode gap is diminished. When the motor drives in the other direction, the cathode is moved away from the anode and the size of the anode-cathode gap is increased. The motor is powered by batteries housed in the hollow cathode. The batteries may be rechargeable, and they may be recharged by a photovoltaic cell in combination with an optical waveguide that received recharging energy from outside the hollow cathode. Alternatively, the anode-cathode gap can be remotely adjusted by a manually-turned handle connected to mechanical linkage which is connected to a jack assembly. The jack assembly converts rotational motion of the handle and mechanical linkage to linear motion of the cathode moving toward or away from the anode.

203 Electrical safety device. White, D.B. To US DOE, Washington, DC (USA). USA Patent 5,014,154/A/. 7 May 1991. Filed date 6 Sep 1990. USA Patent patent application 7-578,155. Int. Cl. H02H 3/16. 2p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an electrical safety device for use in power tools that is designed to automatically discontinue operation of the power tool upon physical contact of the tool with a concealed conductive material. A step down transformer is used to supply the operating power for a disconnect relay and reset relay. When physical contact is made between the power tool and the conductive material, an electrical circuit through the disconnect relay is completed and the operation of the power tool is automatically interrupted. Once the contact between the tool and conductive material is broken, the power tool can be quickly and easily reactivated by a reset push button activating the reset relay. A remote reset is provided for convenience and efficiency of operation.

204 Glove box valve system. Wiggins, R.K. To Dept. of Energy, Washington, DC (USA). USA Patent 4,995,420/A/. 26 Feb 1991. Filed date 10 Aug 1990. USA Patent patent application 7-565,526. Int. Cl. F16K 31/46. 1p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a valve system is provided which enables the opening and closing of a valve to be controlled from outside a hermetically-sealed container such as a glove box. The system also is capable of adjusting the packing nut of the valve from outside the container.

205 Field free, directly heated lanthanum boride cathode. Leung, K.N.; Moussa, D.; Wilde, S.B. To Dept. of Energy, Washington, DC (USA). USA Patent 4,994,706/A/. 19 Feb 1991. Filed date 2 Feb 1987. USA Patent patent application 7-010,053. Int. Cl. H01J 1/15. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a directly heated cylindrical lanthanum boride cathode assembly disclosed which minimizes generation of magnetic fields which would interfere with electron emission from the cathode. The cathode assembly comprises a lanthanum boride cylinder in electrical contact at one end with a central support shaft which functions as one electrode to carry current to the lanthanum boride cylinder and in electrical contact, at its opposite end with a second electrode which is coaxially position around the central support shaft so that magnetic fields generated by heater current flowing in one direction through the central support shaft are canceled by an opposite magnetic field generated by current flowing through the lanthanum boride cylinder and the coaxial electrode in a direction opposite to the current flow in the central shaft.

4205 Materials Testing

Refer also to citation(s) 229, 247

206 High temperature ultrasonic testing of materials for internal flaws. Kupperman, D.S.; Linzer, M. To Dept. of Energy. 23 Aug 1988. USA Patent patent application 7-235,078. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE91017329. Source: OSTI; NTIS; GPO Dep.

An apparatus is disclosed for nondestructive evaluation of defects in hot materials, such as metals and ceramics, by sonic signals, which includes a zirconia buffer in contact with a hot material being tested, a liquid couplant of borax in contact with the zirconia buffer and the hot material to be tested, transmitting means mounted on the zirconia buffer sending sonic signals through the buffer and couplant into the hot material, and receiving means mounted on the zirconia buffer receiving sonic signals reflected from within the hot material through the couplant and the buffer. 2 figs.

207 Method and apparatus for correcting eddy current signal voltage for temperature effects. Kustra, T.A.; Cafferal, A.J. To Dept. of Energy. 29 Aug 1988. USA Patent patent application 7-237,203. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-76PN00014. Order Number DE91017135. Source: OSTI; NTIS; GPO Dep.

An apparatus and method for measuring physical characteristics of an electrically conductive material by the use of eddy-current techniques and compensating measurement errors caused by changes in temperature includes a switching arrangement connected between primary and reference coils of an eddy-current probe which allow the probe to be selectively connected between an eddy current output oscilloscope and a digital ohm-meter for measuring the resistances of the primary and reference coils substantially at the time of eddy current measurement. In this way, changes in resistance due to temperature effects can be completely

taken into account in determining the true error in the eddy current measurement. The true error can consequently be converted into an equivalent eddy current measurement correction.

208 **Multiple direction vibration fixture.** Cericola, F.; Doggett, J.W.; Ernest, T.L. To Dept. of Energy, Washington, DC (United States). USA Patent 5,042,306/A/. 27 Aug 1991. Filed date 21 Mar 1990. USA Patent patent application 7-496,712. Int. Cl. B06B 3/00. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

An apparatus is discussed for simulating a rocket launch environment on a test item undergoing centrifuge testing by subjecting the item simultaneously or separately to vibration along an axis of centripetal force and along an axis perpendicular to the centripetal force axis. The apparatus includes a shaker motor supported by centrifuge arms and a right angle fixture pivotally connected to one of the shaker motor mounts. When the shaker motor vibrates along the centripetal force axis, the vibrations are imparted to a first side of the right angle fixture. The vibrations are transmitted 90 ° around the pivot and are directed to a second side of the right angle fixture which imparts vibrations perpendicular to the centripetal force axis. The test item is in contact with a third side of the right angle fixture and receives both centripetal-force-axis vibrations and perpendicular axis vibrations simultaneously. A test item can be attached to the third side near the flexible coupling or near the air bag to obtain vibrations along the centripetal force axis or transverse to the centripetal force axis.

209 **Method and apparatus for millimeter-wave detection of thermal waves for materials evaluation.** Gopalsami, N.; Raptis, A.C. To Dept. of Energy, Washington, DC (USA). USA Patent 5,020,920/A/. 4 Jun 1991. Filed date 3 Nov 1989. USA Patent patent application 7-431,363. Int. Cl. G01N 25/00. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a method and apparatus for generating thermal waves in a sample and for measuring thermal inhomogeneities at subsurface levels using millimeter-wave radiometry. An intensity modulated heating source is oriented toward a narrow spot on the surface of a material sample and thermal radiation in a narrow volume of material around the spot is monitored using a millimeter-wave radiometer; the radiometer scans the sample point-by-point and a computer stores and displays inphase and quadrature phase components of thermal radiations for each point on the scan. Alternatively, an intensity modulated heating source is oriented toward a relatively large surface area in a material sample and variations in thermal radiation within the full field or an antenna array are obtained using an aperture synthesis radiometer technique.

210 **Nondestructive material characterization.** Deason, V.A.; Johnson, J.A.; Telschow, K.L. To Dept. of Energy, Washington, DC (USA). USA Patent 4,995,260/A/. 26 Feb 1991. Filed date 14 Jul 1989. USA Patent patent application 7-379,832. Int. Cl. G01N 29/00. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a method and apparatus for nondestructive material characterization, such as identification of material flaws or defects, material thickness or uniformity and material properties such as acoustic velocity. The apparatus comprises a pulsed laser used to excite a piezoelectric (PZ) transducer, which sends acoustic waves through an acoustic coupling medium to the test material. The acoustic wave is absorbed and thereafter reflected by the test material, whereupon it impinges on the PZ transducer. The PZ transducer converts the acoustic wave to electrical impulses, which are conveyed to a monitor.

211 **Method and apparatus for the simultaneous display and correlation of independently generated images.** Vaitekunas, J.J.; Roberts, R.A. To Dept. of Energy, Washington, DC (USA). USA Patent 4,987,412/A/. 22 Jan 1991. Filed date 25 Aug 1988. USA Patent patent application 7-236,582. Int. Cl. G02G 5/08. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an apparatus and method for location by location correlation of multiple images from Non-Destructive Evaluation (NDE) and other sources. Multiple images of a material specimen are displayed on one or more monitors of an interactive graphics system. Specimen landmarks are located in each image and mapping functions from a reference image to each other image are calculated using the landmark locations. A location selected by positioning a cursor in the reference image is mapped to the other images and location identifiers are simultaneously displayed in those images. Movement of the cursor in the reference image causes simultaneous movement of the location identifiers in the other images to positions corresponding to the location of the reference image cursor.

4210 Combustion Systems

212 **Self-powered automatic secondary air controllers for woodstoves and small furnaces.** Siemer, D.D. To US DOE, Washington, DC (USA). USA Patent 5,014,680/A/. 14 May 1991. Filed date 15 Mar 1989. USA Patent patent application 7-323,924. Int. Cl. F24C 1/14. 11p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a controller for automatically regulating the supply of secondary combustion air to wood stoves and small furnaces. The controller includes a movable air valve for controlling the amount of secondary air admitted into the chamber. A self powered means monitors the concentration of combustible gases and vapors and actuates the movable air valve to increase the supply of secondary air in response to increasing concentrations of the combustible gases and vapors. The self-powered means can be two fluid filled sensor bulbs, one of which has a coating of a combustion catalyst. Alternatively, the self powered means can be two metallic stripes laminated together, one of which is coated with a combustion catalyst, and when heated causes the air valve to actuate.

4260 Components, Electron Devices and Circuits

Refer also to citation(s) 21, 23, 31, 46, 48, 50, 80, 81, 96, 97, 98, 102, 130, 131, 197, 210, 211, 213, 219, 225, 228, 251

213 Fusion pumped light source. Pappas, D.S. To Dept. of Energy. 1 Sep 1988. USA Patent patent application 7-239,584. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE91017339. Source: OSTI; NTIS; GPO Dep.

Apparatus is provided for generating energy in the form of light radiation. A fusion reactor is provided for generating a long, or continuous, pulse of high-energy neutrons. The neutron flux is coupled directly with the lasing medium. The lasing medium includes a first component selected from Group O of the periodic table of the elements and having a high inelastic scattering cross section. Gamma radiation from the inelastic scattering reactions interacts with the first component to excite the first component, which decays by photon emission at a first output wavelength. The first output wavelength may be shifted to a second output wavelength using a second liquid component responsive to the first output wavelength. The light outputs may be converted to a coherent laser output by incorporating conventional optics adjacent the lasing medium. 3 figs.

214 Method for enhancement of useful luminescence from vacancy defects in refractory oxides for tunable lasers and the refractory oxides produced thereby. Chen, Yok. To Dept. of Energy. 12 Sep 1988. USA Patent patent application 7-243,534. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE91017340. Source: OSTI; NTIS; GPO Dep.

Refractory oxide crystals suitable for use in tunable lasers and a method for preparing the same are provided. The crystals are characterized by high quantum efficiency, high thermal stability, good crystal transparency, and a high percentage of useful luminescence. The method for preparation of the crystals involves removing substantially all the hydrogen, thermochemically reducing the crystal's oxygen content to produce oxygen (anion) vacancy defects, and subsequently irradiating the crystal with electrons to inactivate trace H^{minus} ions so that an increased amount of short lived F^{+} luminescence is produced when the crystal is optically excited.

215 Laser-triggered vacuum switch. Brannon, P.J.; Cowgill, D.F. To Dept. of Energy. 27 Sep 1988. USA Patent patent application 7-249,815. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE91017346. Source: OSTI; NTIS; GPO Dep.

This invention pertains to a laser-triggered vacuum switch that has a material such as a alkali metal halide on the cathode electrode for thermally activated field emission of electrons and ions upon interaction with a laser beam, the material being in contact with the cathode with a surface facing the discharge gap. The material is preferably a mixture of KCl and Ti powders. The laser may either shine directly on the material, preferably through a hole in the anode, or be directed to the material over a fiber optic cable. 6 figs.

216 Apparatus and method for tuned unsteady flow purging of high pulse rate spark gaps. Thayer, W.J. III. To Dept. of Energy. 12 Oct 1988. USA Patent patent application 7-256,430. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-85SF15930. Order Number DE91017354. Source: OSTI; NTIS; GPO Dep.

A spark gap switch apparatus is disclosed which is capable of operating at a high pulse rate which comprises an insulated housing; a pair of spaced apart electrodes each having one end thereof within a first bore formed in the housing and defining a spark gap therebetween; pressure wave reflector means in the first bore in the housing and spaced from the spark gap and capable of admitting purge flow; and a second enlarged bore contiguous with the first bore and spaced from the opposite side of the spark gap; hereby pressure waves generated during discharge of a spark across the spark gap will reflect off the wave reflector means and back from the enlarged bore to the spark gap to clear from the spark gap hot gases residues generated during the discharge and simultaneously restore the gas density and pressure in the spark gap to its initial value. 8 figs.

217 Control system for an interior permanent magnet synchronous machine. Bose, B.K. To Dept. of Energy. 12 Oct 1988. USA Patent patent application 7-256,432. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-85NV10418. Order Number DE91016971. Source: OSTI; NTIS; GPO Dep.

A high performance, fully operational, four-quadrant control scheme is used in an interior permanent magnet synchronous machine. The machine operates smoothly with full performance in the constant-torque region as well as in the flux-weakening, constant-power region in both directions of motion. The transition between the constant-torque and constant-power regions is very smooth under all conditions of operation. Control in the constant-torque region is based on a vector or field-oriented technique, with the direct-axis aligned with the total stator flux, whereas constant-power region control is accomplished by orientation of the torque angle of the impressed square-wave voltage through the feedforward vector rotator. In a preferred embodiment, the control system employs a digital distributed microcomputer controller arrangement which relies upon various precisely estimated feedback signals, such as torque, flux, etc. The control scheme includes an outer torque control loop primarily for traction type applications, but also contemplates speed and position control loops for various industrial drives. A 70 hp drive system using a Neodymium-Iron-Boron permanent magnet machine and transistor pulse width modulating inverter has been designed and successfully tested. This control scheme also has application in controlling surface permanent magnet machines. 16 figs.

218 Improved spark gap switch system with condensable dielectric gas. Thayer, W.J. III. To Dept. of Energy. 12 Oct 1988. USA Patent patent application 7-256,839. 25p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC03-85SF15930. Order Number DE91016972. Source: OSTI; NTIS; GPO Dep.

A spark gap switch system is disclosed which is capable of operating at a high pulse rate comprising an insulated switch housing having a purging gas entrance port and a gas exit port, a pair of spaced apart electrodes each having one end thereof within the housing and defining a spark gap therebetween, an easily condensable and preferably low molecular weight insulating gas flowing through the switch housing from the entrance port to the exit port to purge hot gases from the housing, condensing means for condensing the insulating gas after it exits from the housing, pump means for recirculating the condensed insulating gas as a liquid back to the housing, and vaporizing means to vaporize at least a portion of the condensed insulating gas back into a vapor prior to flowing the insulating gas back into the housing. 2 figs.

219 **Switchable auto gain amplifier.** Boye, C.A.; Phipps, G.S.; Schaefer, J.P. To Dept. of Energy. 21 Oct 1988. USA Patent patent application 7-260,756. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE91016977. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a switchable auto gain amplifier system for amplifying electrical signals of unknown magnitude has a plurality of amplifiers having different gains, each amplifier having an input connected to a system input. A switch controllably directs only one of the amplifier outputs to a system output. The switch is controlled by comparators providing an electrical outputs indicating each saturated amplifier. 2 figs.

220 **Formation of multiple levels of porous silicon for buried insulators and conductors in silicon device technologies.** Blewer, R.S.; Guilinger, T.R.; Kelly, M.J.; Tsao, S.S. To Dept. of Energy. 22 Nov 1988. USA Patent patent application 7-274,892. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE91017139. Source: OSTI; NTIS; GPO Dep.

A method of forming a multiple level porous silicon substrate for semiconductor integrated circuits including anodizing non-porous silicon layers of a multi-layer silicon substrate to form multiple levels of porous silicon. At least one porous silicon layer is then oxidized to form an insulating layer and at least one other layer of porous silicon beneath the insulating layer is metallized to form a buried conductive layer. Preferably the insulating layer and conductive layer are separated by an anodization barrier formed of non-porous silicon. By etching through the anodization barrier and subsequently forming a metallized conductive layer, a fully or partially insulated buried conductor may be fabricated under single crystal silicon. 6 figs.

221 **High voltage bipolar-CMOS structure using porous silicon.** Guilinger, T.R.; Kelly, M.J.; Tsao, S.S. To Dept. of Energy. 1990. Filed date 8 May 1990. USA Patent patent application 7-520,475. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE92004613. Source: OSTI; NTIS; GPO Dep.

A method for integrating a silicon-on-insulator device and a bulk bipolar device on a semiconductor body. The invention simultaneously forms the two regions for the silicon-on-insulator device and the bipolar device. The invention enables a high voltage CMOS power device to be located on the same chip as a bipolar logic device enabling smart power devices.

222 **Rectifier cabinet static breaker.** Costantino, R.A.; Gliebe, R.J. To Dept. of Energy. 1990. Filed date 30 May 1990. USA Patent patent application 7-530,513. 27p. Sponsored by National Aeronautics and Space Administration, Washington, DC (United States). Contract N00024-79-C-4026. Order Number DE92004620. Source: OSTI; NTIS; GPO Dep.

A rectifier cabinet static breaker replaces a blocking diode pair with an SCR and the installation of a power transistor in parallel with the latch contactor to commutate the SCR to the off state. The SCR serves as a static breaker with fast turnoff capability providing an alternative way of achieving reactor scram in addition to performing the function of the replaced blocking diodes. The control circuitry for the rectifier cabinet static breaker includes on-line test capability and an LED indicator light to denote successful test completion. Current limit circuitry provides high-speed protection in the event of overload.

223 **Apparatus and process for active pulse intensity control of laser beam.** Wilcox, R.B. To Dept. of Energy. 1990. Filed date 19 Jun 1990. USA Patent patent application 7-540,237. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE92003810. Source: OSTI; NTIS; GPO Dep.

An optically controlled laser pulse energy control apparatus and process is disclosed wherein variations in the energy of a portion of the laser beam are used to vary the resistance of a photodetector such as a photoresistor through which a control voltage is fed to a light intensity controlling device through which a second portion of the laser beam passes. Light attenuation means are provided to vary the intensity of the laser light used to control the resistance of the photodetector. An optical delay path is provided through which the second portion of the beam travels before reaching the light intensity controlling device. The control voltage is supplied by a variable power supply. The apparatus may be tuned to properly attenuate the laser beam passing through the intensity controlling device by adjusting the power supply, the optical delay path, or the light attenuating means. 3 figs.

224 **Counterrotating brushless dc permanent magnet motor.** Hawsey, R.A.; Bailey, J.M. To Dept. of Energy. 1990. Filed date 30 Jul 1990. USA Patent patent application 7-559,030. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE92003825. Source: OSTI; NTIS; GPO Dep.

An brushless DC permanent magnet motor is provided for driving an autonomous underwater vehicle. In one embodiment, the motor comprises four substantially flat stators disposed in stacked relationship, with pairs of the stators being axially spaced and each of the stators comprising a tape-wound stator coil; and a first and second substantially

flat rotors disposed between the spaced pairs of stators. Each of the rotors includes an annular array of permanent magnets embedded therein. A first shaft is connected to the first rotor and a second, concentric shaft is connected to the second rotor, and drive unit causes rotation of the two shafts in opposite directions. The second shaft comprises a hollow tube having a central bore therein in which the first shaft is disposed. Two different sets of bearings support the first and second shAfts. In another embodiment, the motor comprises two ironless stators and pairs and rotors mounted no opposite sides of the stators and driven by counterrotating shafts.

225 **Rotary drive mechanism.** Kenderdine, E.W. To Dept. of Energy, Washington, DC (United States). USA Patent 5,055,727/A/. 8 Oct 1991. Filed date 26 Feb 1990. USA Patent patent application 7-484,302. Int. Cl. H02K 7/10. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a rotary drive mechanism which includes a rotary solenoid having a stator and multi-poled rotor. A moving member rotates with the rotor and is biased by a biasing device. The biasing device causes a further rotational movement after rotation by the rotary solenoid. Thus, energization of the rotary solenoid moves the member in one direction to one position and biases the biasing device against the member. Subsequently, de- energization of the rotary solenoid causes the biasing device to move the member in the same direction to another position from where the moving member is again movable by energization and de-energization of the rotary solenoid. Preferably, the moving member is a multi-lobed cam having the same number of lobes as the rotor has poles. An anti- overdrive device is also preferably provided for preventing overdrive in the forward direction or a reverse rotation of the moving member and for precisely aligning the moving member.

226 **Nonvolatile semiconductor memory having three dimension charge confinement.** Dawson, L.R.; Osbourn, G.C.; Peercy, P.S.; Weaver, H.T.; Zipperian, T.E. To Dept. of Energy, Washington, DC (United States). USA Patent 5,055,890/A/. 8 Oct 1991. Filed date 25 Jan 1990. USA Patent patent application 7-469,995. Int. Cl. H01L 29/161. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a layered semiconductor device with a nonvolatile three dimensional memory which comprises a storage channel which stores charge carriers. Charge carriers flow laterally through the storage channel from a source to a drain. Isolation material, either a Schottky barrier or a heterojunction, located in a trench of an upper layer controllably retains the charge within the a storage portion determined by the confining means. The charge is retained for a time determined by the isolation materials' nonvolatile characteristics or until a change of voltage on the isolation material and the source and drain permit a read operation. Flow of charge through an underlying sense channel is affected by the presence of charge within the storage channel, thus the presences of charge in the memory can be easily detected.

227 **Motorized control for mirror mount apparatus.** Cutburth, R.W. To Dept. of Energy, Washington, DC (USA). USA Patent 4,811,619/A/. 14 Mar 1989. Filed date 6 Jun 1988. USA Patent patent application 7-204,944. Int. Cl. F16H 25/20. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a motorized control and automatic braking system for adjusting mirror mount apparatus. The motor control includes a planetary gear arrangement to provide improved pitch adjustment capability while permitting a small packaged design. The motor control for mirror mount adjustment is suitable for laser beam propagation applications. The brake is a system of constant contact, floating detents which engage the planetary gear at selected between-teeth increments to stop rotation instantaneously when the drive motor stops.

228 **Feedback stabilization system for pulsed single longitudinal mode tunable lasers.** Esherick, P.; Raymond, T.D. To Dept. of Energy, Washington, DC (United States). USA Patent 5,054,028,/A/. 1 Oct 1991. Filed date 20 Apr 1989. USA Patent patent application 7-340,823. Int. Cl. H01S 3/137. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a feedback stabilization system for pulse single longitudinal mode tunable lasers having an excited laser medium contained within an adjustable length cavity and producing a laser beam through the use of an internal dispersive element, including detection of angular deviation in the output laser beam resulting from detuning between the cavity mode frequency and the passband of the internal dispersive element, and generating an error signal based thereon. The error signal can be integrated and amplified and then applied as a correcting signal to a piezoelectric transducer mounted on a mirror of the laser cavity for controlling the cavity length.

229 **Built-in-test by signature inspection (BITSI).** Bergeson, G.C.; Morneau, R.A. To Dept. of Energy, Washington, DC (United States). USA Patent 5,051,996/A/. 24 Sep 1991. Filed date 27 Mar 1989. USA Patent patent application 7-328,917. Int. Cl. G06F 11/00. 9p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a system and method for fault detection for electronic circuits. A stimulus generator sends a signal to the input of the circuit under test. Signature inspection logic compares the resultant signal from test nodes on the circuit to an expected signal. If the signals do not match, the signature inspection logic sends a signal to the control logic for indication of fault detection in the circuit. A data input multiplexer between the test nodes of the circuit under test and the signature inspection logic can provide for identification of the specific node at fault by the signature inspection logic. Control logic responsive to the signature inspection logic conveys information about fault detection for use in determining the condition of the circuit. When used in conjunction with a system test controller, the built-in test by signature inspection system and method can be used to poll a plurality of circuits automatically and continuous for faults and record the results of such polling in the system test controller.

230 **Explosively pumped laser light.** Piltch, M.S.; Michelott, R.A. To Dept. of Energy, Washington, DC (United States). USA Patent 5,052,011/A/. 24 Sep 1991. Filed date 16 Jan 1991. USA Patent patent application 7-641,821. Int. Cl. H01S 3/091. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a single shot laser pumped by detonation of an explosive in a shell casing. The shock wave from detonation of the explosive causes a rare gas to luminesce. The high intensity light from the gas enters a lasing medium, which thereafter outputs a pulse of laser light to disable optical sensors and personnel.

231 **Device having two optical ports for switching applications.** Rosen, A.; Stabile, P.J. To Dept. of Energy, Washington, DC (United States). USA Patent 5,051,789/A/. 24 Sep 1991. Filed date 11 Oct 1990. USA Patent patent application 7-595,528. Int. Cl. H01L 31/12. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A two-sided light-activatable semiconductor switch device is described having an optical port on each side thereof. The semiconductor device may be a p-i-n diode or of bulk intrinsic material. A two ported p-i-n diode, reverse-biased to off by a 1.3 kV dc power supply, conducted 192 A when activated by two 1 kW laser diode arrays, one for each optical port.

232 **Piezoelectric measurement of laser powder.** Deason, V.A.; Johnson, J.A.; Telschow, K.L. To Dept. of Energy, Washington, DC (United States). USA Patent 5,048,969/A/. 17 Sep 1991. Filed date 20 Nov 1989. USA Patent patent application 7-438,378. Int. Cl. G01N 21/00. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A method is described for measuring the energy of individual laser pulses or a series of laser pulses by reading the output of a piezoelectric (PZ) transducer which has received a known fraction of the total laser pulse beam. An apparatus is disclosed that reduces the incident energy on the PZ transducer by means of a beam splitter placed in the beam of the laser pulses.

233 **Ion-implanted planar-buried-heterostructure diode laser.** Brennan, T.M.; Hammons, B.E.; Myers, D.R.; Vawter, G.A. To Dept. of Energy, Washington, DC (United States). USA Patent 5,048,038/A/. 10 Sep 1991. Filed date 25 Jan 1990. USA Patent patent application 7-469,996. Int. Cl. H01S 3/19. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A Planar-Buried-Heterostructure, Graded-Index, Separate-Confinement-Heterostructure semiconductor diode laser is described that includes a single quantum well or multi-quantum well active stripe disposed between a p-type compositionally graded Group III-V cladding layer and an n-type compositionally graded Group III-V cladding layer. The laser 10 includes an ion implanted n-type region within the p-type cladding layer and further includes an ion implanted p-type region within the n-type cladding layer. The ion implanted regions are disposed for defining a lateral extent of the active stripe.

234 **Electrical grounding prong socket.** Leong, R. To US DOE, Washington, DC (USA). USA Patent 5,024,602/A/. 18 Jun 1991. Filed date 31 May 1990. USA Patent patent application 7-531,437. Int. Cl. H01R 13/11. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a socket for a grounding prong used in a three prong electrical plug and a receptacle for the three prong plug. The socket being sufficiently spacious to prevent the socket from significantly stretching when a larger, U-shaped grounding prong is inserted into the socket, and having a ridge to allow a snug fit when a smaller tubular shape grounding prong is inserted into the socket.

235 **Ring laser having an output at a single frequency.** Hackell, L.A. To Dept. of Energy, Washington, DC (USA). USA Patent 5,022,033/A/. 4 Jun 1991. Filed date 30 Oct 1989. USA Patent patent application 7-428,540. Int. Cl. H01S 3/11. 7p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a ring laser that produces a single frequency of laser radiation in either the pulsed mode of operation or the continuous waveform (cw) mode of operation. The laser comprises a ring laser in a bowtie configuration, a birefringent gain material such as Nd:YLF, an improved optical diode that supports laser oscillation having a desired direction of travel and linear polarization, and a Q-switch. An output coupler (mirror) having a high reflectivity, such as 94%, is disclosed. Also disclosed is a self-seeded method of operation in which the laser can provide a pulse or a series of pulses of high power laser radiation at a consistent single frequency with a high degree of amplitude stability and temporal stability. In operation, the laser is operated in continuous waveform (cw) at a low power output with the Q-switch introducing a loss into the resonating cavity. Pumping is continued at a high level, causing the gain material to store energy.

236 **Dye system for dye laser applications.** Hammond, P.R. To US DOE, Washington, DC (USA). USA Patent 5,018,160/A/. 21 May 1991. Filed date 8 Aug 1990. USA Patent patent application 7-564,240. Int. Cl. H01S 3/20. 2p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a dye of the DCM family, [2-methyl-6-[2-(1,2,3,4-tetrahydro-1-methyl-6-quinolinyl) ethenyl]-4H-pyran-4-ylidene]-propanedinitrile, dissolved in 2-phenoxyethanol, is non-mutagenic, stable and efficient, particularly in a pumped continuous wave laser system.

237 **Apparatus and method for increasing the bandwidth of a laser beam.** Chaffee, P.H. To US DOE, Washington, DC (USA). USA Patent 5,015,054/A/. 14 May 1991. Filed date 26 Feb 1990. USA Patent patent application 7-484,304. Int. Cl. G02B 6/26. 6p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a method and apparatus that provides a laser output beam having a broad bandwidth and an intensity smooth over time. The bandwidth of the laser output can be varied easily by varying the intensity of a broadband source. The present invention includes an optical

modulation apparatus comprising a narrowband laser that outputs a horizontally polarized beam (signal beam) and a broadband laser that outputs a vertically polarized beam (a pump beam) whose intensity varies rapidly. The two beam are coupled into a birefringent laser material so that the respective polarizations coincide with the principal axes of the material. As the two beams travel through the material, the polarization preserving properties of the birefringent material maintain the respective polarizations of the two beam; however there is coupling between the two beams as a result of cross phase modulations, which induces a bandwidth change of the signal beam.

238 **X-ray lasers and methods utilizing two component driving illumination provided by optical laser means of relatively low energy and small physical size.** Rosen, M.D.; Matthews, D.L. To US DOE, Washington, DC (USA). USA Patent 5,016,250/A/. 14 May 1991. Filed date 18 Oct 1989. USA Patent patent application 7-423,165. Int. Cl. H01S 3/30. 7p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an x-ray laser, and related methodology, wherein an x-ray laser target is illuminated with a first pulse of optical laser radiation of relatively long duration having scarcely enough energy to produce a narrow and linear cool plasma of uniform composition. A second, relatively short pulse of optical laser radiation is uniformly swept across the length, from end to end, of the plasma, at about the speed of light, to consecutively illuminate continuously succeeding portions of the plasma with optical laser radiation having scarcely enough energy to heat, ionize, and invert them into the continuously succeeding portions of an x-ray gain medium. This inventive double pulse technique results in a saving of more than two orders of magnitude in driving optical laser energy, when compared to the conventional single pulse approach.

239 **X-ray laser.** Nilsen, J. To US DOE, Washington, DC (USA). USA Patent 5,003,544/A/. 26 Mar 1991. Filed date 12 Oct 1989. USA Patent patent application 7-420,433. Int. Cl. H01S 3/30. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an x-ray laser that lases between the K edges of carbon and oxygen, i.e., between 44 and 23 Angstroms, is provided. The laser comprises a silicon and dysprosium foil combination that is driven by two beams of intense line focused optical laser radiation. Ground state nickel-like dysprosium ions are resonantly photo-pumped to their upper x-ray laser state by line emission from hydrogen-like silicon ions. The novel x-ray laser should prove especially useful for the microscopy of biological specimens.

240 **Digital optical conversion module.** Kotter, D.K.; Rankin, R.A. To Dept. of Energy, Washington, DC (USA). USA Patent 4,996,531/A/. 26 Feb 1991. Filed date 19 Jul 1988. USA Patent patent application 7-221,394. Int. Cl. H03M 1/60. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a digital optical conversion module used to convert an analog signal to a computer compatible digital signal including a voltage-to-frequency converter, frequency offset response circuitry, and an electrical-to-optical converter. Also used in conjunction with the digital optical conversion module is an optical link and an interface at the computer for converting the optical signal back to an electrical signal. Suitable for use in hostile environments having high levels of electromagnetic interference, the conversion module retains high resolution of the analog signal while eliminating the potential for errors due to noise and interference. The module can be used to link analog output scientific equipment such as an electrometer used with a mass spectrometer to a computer.

241 **Method of preparing novel fluorinated lasers dyes.** Hammond, P.R.; Freeman, J.F. To Dept. of Energy, Washington, DC (United States). USA Patent 5,992,560/A/. 12 Feb 1991. Filed date 18 May 1990. USA Patent patent application 7-524,899. Int. Cl. C07D 311/88. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a class of dye that is disclosed which is particularly efficient and stable for dye laser applications, lasing between 540 and 570 nm.

242 **Test probe for surface mounted leadless chip carrier.** Meyer, K.L.; Topolewski, J. To Dept. of Energy, Washington, DC (USA). USA Patent 4,833,404/A/. 23 May 1989. Filed date 2 Oct 1987. USA Patent patent application 7-103,865. Int. Cl. G01R 1/06. 6p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a test probe for a surface mounted leadless chip carrier. The probe includes specially designed connector pins which allow size reductions in the probe. A thermoplastic housing provides spring action to ensure good mechanical and electrical contact between the pins and the contact strips of a leadless chip carrier. Other features include flexible wires molded into the housing and two different types of pins alternately placed in the housing. These features allow fabrication of a smaller and simpler test probe.

43 PARTICLE ACCELERATORS

4302 Beam Dynamics, Field Calculations, and Ion Optics

Refer also to citation(s) 23, 188

4303 Auxiliaries and Components

Refer also to citation(s) 23

243 **A Stripline Fast Faraday Cup for measuring GHz structure of ion beams.** Bogaty, J.M. To Dept. of Energy. 1990. Filed date 3 Jul 1990. USA Patent patent application 7-547,748. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE92003819. Source: OSTI; NTIS; GPO Dep.

The Stripline Fast Faraday Cup is a device which is used to quantitatively and qualitatively measure gigahertz time structure characteristics of ion beams with energies up to at

least 30 Mev per nucleon. A stripline geometry is employed in conjunction with an electrostatic screen and a Faraday cup to provide for analysis of the structural characteristics of an ion beam. The stripline geometry allows for a large reduction in the size of the instrument while the electrostatic screen permits measurements of the properties associated with low speed ion beams.

244 **Adaptive control for accelerators.** Eaton, L.E.; Jachim, S.P.; Natter, E.F. To Dept of Energy, Washington, DC (USA). USA Patent 4,982,320/A/. 1 Jan 1991. Filed date 28 Oct 1988. USA Patent patent application 7-263,852. Int. Cl. G05B 13/02. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an adaptive feedforward control loop is provided to stabilize accelerator beam loading of the radio frequency field in an accelerator cavity during successive pulses of the beam into the cavity. A digital signal processor enables an adaptive algorithm to generate a feedforward error correcting signal functionally determined by the feedback error obtained by a beam pulse loading the cavity after the previous correcting signal was applied to the cavity. Each cavity feedforward correcting signal is successively stored in the digital processor and modified by the feedback error resulting from its application to generate the next feedforward error correcting signal. A feedforward error correcting signal is generated by the digital processor in advance of the beam pulse to enable a composite correcting signal and the beam pulse to arrive concurrently at the cavity.

44 INSTRUMENTATION

4401 Radiation Instrumentation

Refer also to citation(s) 25, 42, 188, 240, 252

245 **Improved ionization chamber dosimeter.** Renner, T.R.; Nyman, M.A.; Stradtner, R. To Dept. of Energy. 1990. Filed date 16 Apr 1990. USA Patent patent application 7-509,121. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE92003876. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a method for fabricating an ion chamber dosimeter collecting array of the type utilizing plural discrete elements formed on a uniform collecting surface which includes forming a thin insulating layer over an aperture in a frame having surfaces, forming a predetermined pattern of through holes in the layer, plating both surfaces of the layer and simultaneously tilting and rotating the frame for uniform plate-through of the holes between surfaces. Aligned masking and patterned etching of the surfaces provides interconnects between the through holes and copper leads provided to external circuitry.

246 **X-ray imaging system.** Sommargren, G.E.; Weaver, H.J. To Dept. of Energy. 1990. Filed date 30 Apr 1990. USA Patent patent application 7-516,401. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE92003830. Source: OSTI; NTIS; GPO Dep.

The invention provides a method and apparatus for focusing and imaging x-rays. An opaque sphere is used as a diffractive imaging element to diffract x-rays from an object so that the divergent x-ray wavefronts are transformed into convergent wavefronts and are brought to focus to form an image of the object with a large depth of field. 6 figs.

247 **A backscattering spectrometry device for identifying unknown elements present in a workpiece.** Doyle, B.L.; Knapp, J.A. To Dept. of Energy. 1990. Filed date 30 May 1990. USA Patent patent application 7-530,672. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE92004621. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a backscattering spectrometry method and device for identifying and quantifying impurities in a workpiece during processing and manufacturing of that workpiece. While the workpiece is implanted with an ion beam, that same ion beam backscatters resulting from collisions with known atoms and with impurities within the workpiece. Those ions backscatter along a predetermined scattering angle and are filtered using a self-supporting filter to stop the ions with a lower energy because they collided with the known atoms of the workpiece of a smaller mass. Those ions which pass through the filter have a greater energy resulting from impact with impurities having a greater mass than the known atoms of the workpiece. A detector counts the number and measures the energy of the ions which pass through the filter. From the energy determination and knowledge of the scattering angle, a mass calculation determines the identity, and from the number and solid angle of the scattering angle, a relative concentration of the impurity is obtained.

248 **A circuit for monitoring electric currents produced by a twin bridge calorimeter.** Donohoue, T.P.; Oertal, C.P.; Tyree, W.H.; Valdez, J.L. To Dept. of Energy. 1990. Filed date 19 Jun 1990. USA Patent patent application 7-540,240. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. Order Number DE92003811. Source: OSTI; NTIS; GPO Dep.

A circuit for measuring temperature differentials in a calorimeter is disclosed. The temperature differential between the reference element and sample element containing a radioactive material is measured via a wheatstone bridge arrangement of thermistors. The bridge is driven with an alternating current on a pulsed basis to maintain the thermal floor of the calorimeter at a low reference value. A lock-in amplifier connected to the bridge phase locks a signal from the bridge to the input pulsed AC signal to provide a DC voltage. The DC voltage is sampled over time and provided to a digital computer. The digital computer, using curve fitting algorithms, will derive a function for the sample data. From the function, an equilibrium value for the temperature may be calculated. 4 figs.

249 **Punchcode reader system for dosimeters.** Langsted, J.M. To Dept. of Energy. 1990. Filed date 31 Jul 1990. USA Patent patent application 7-560,667. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. Order Number DE92003828. Source: OSTI; NTIS; GPO Dep.

A punchcode reader is provided for reading data encoded in a punchcode hole array on a dosimeter. The dosimeter falls through a passage in the reader containing photosensor detectors disposed along the passage which provide output signals to a microprocessor. The signals are processed to determine the orientation of the dosimeter in the reader, the location and state of punchcode holes in a two row array thereby decoding the encoded data. Multiple rate of fall calculations are made, and if appropriate matching of the punchcode array is not obtained in three tries, an error signal is outputted to the operator. The punchcode reader also provides for storage of data from multiple dosimeters passed through the reader, and for the output of decoded data to an external display or a computer for further processing. 2 figs.

250 **Chromatic x-ray magnifying method and apparatus by Bragg reflective planes on the surface of Abbe sphere.** Thoe, R.S. To Dept. of Energy, Washington, DC (United States). USA Patent 5,027,377/A/. 25 Jun 1991. Filed date 9 Jan 1990. USA Patent patent application 7-462,254. Int. Cl. G21K 1/00. 8p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

Method and apparatus for producing sharp, chromatic, magnified images of X-ray emitting objects, are provided. The apparatus, which constitutes an x-ray microscope or telescope, comprises a connected collection of Bragg reflecting planes, comprised of either a bent crystal or a synthetic multilayer structure, disposed on and adjacent to a locus determined by a spherical surface. The individual Bragg planes are spatially oriented to Bragg reflect radiation from the object location toward the image location. This is accomplished by making the Bragg planes spatially coincident with the surfaces of either a nested series of prolate ellipsoids of revolution, or a nested series of spheres. The spacing between the Bragg reflecting planes can be tailored to control the wavelengths and the amount of the X-radiation that is Bragg reflected to form the X-ray image.

251 **Real time Faraday spectrometer.** Smith, T.E.; Struve, K.W.; Colella, N.J. To US DOE, Washington, DC (USA). USA Patent 5,017,779/A/. 21 May 1991. Filed date 30 Apr 1990. USA Patent patent application 7-516,402. Int. Cl. H01J 49/00. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an invention which uses a dipole magnet to bend the path of a charged particle beam. As the deflected particles exit the magnet, they are spatially dispersed in the bend-plane of the magnet according to their respective momenta and pass to a plurality of chambers having Faraday probes positioned therein. Both the current and energy distribution of the particles is then determined by the non-intersecting Faraday probes located along the chambers. The Faraday probes are magnetically isolated from each other by thin metal walls of the chambers, effectively providing real time current-versus-energy particle measurements.

252 **Process and apparatus for detecting presence of plant substances.** Kirby, J.A. To US DOE, Washington, DC (USA). USA Patent 5,008,539/A/. 16 Apr 1991. Filed date 1 Aug 1990. USA Patent patent application 7-561,633. Int. Cl. G01N 33/00. 7p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an apparatus and process for detecting the presence of plant substances in a particular environment. It comprises: measuring the background K40 gamma ray radiation level in a particular environment with a 1.46 MeV gamma ray counter system; measuring the amount of K40 gamma ray radiation emanating from a package containing a plant substance being passed through an environment with a counter; and generating an alarm signal when the total K40 gamma ray radiation reaches a predetermined level over and above the background level.

253 **Spinning angle optical calibration apparatus.** Beer, S.K.; Pratt, H.R. To Dept. of Energy, Washington, DC (USA). USA Patent 4,996,483/A/. 26 Feb 1991. Filed date 12 Sep 1989. USA Patent patent application 7-406,004. Int. Cl. G01R 33/20. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an optical calibration apparatus provided for calibrating and reproducing spinning angles in cross-polarization, nuclear magnetic resonance spectroscopy. An illuminated magnifying apparatus enables optical setting an accurate reproducing of spinning magic angles in cross-polarization, nuclear magnetic resonance spectroscopy experiments. A reference mark scribed on an edge of a spinning angle test sample holder is illuminated by a light source and viewed through a magnifying scope. When the magic angle of a sample material used as a standard is attained by varying the angular position of the sample holder, the coordinate position of the reference mark relative to a graduation or graduations on a reticle in the magnifying scope is noted.

4404 Well Logging Instrumentation

254 **Downhole hydraulic seismic generator.** Gregory, D.L.; Hardee, H.C.; Smallwood, D.O. To Dept. of Energy. 1990. Filed date 19 Apr 1990. USA Patent patent application 7-511,372. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE92004602. Source: OSTI; NTIS; GPO Dep.

A downhole hydraulic seismic generator system for transmitting energy wave vibrations into earth strata surrounding a borehole. The system contains an elongated, unitary housing operably connected to a well head aboveground by support and electrical cabling, and contains clamping apparatus for selectively clamping the housing to the walls of the borehole. The system further comprises a hydraulic oscillator containing a double-actuating piston whose movement is controlled by an electro-servovalve regulating a high pressure hydraulic fluid flow into and out of upper and lower chambers surrounding the piston. The spent hydraulic fluid from the hydraulic oscillator is stored and pumped back into the system to provide high pressure fluid for conducting another run at the same, or a different location within the borehole. 4 figs.

4405 Thermal Instrumentation

Refer also to citation(s) 153, 192

255 **Optical Johnson noise thermometry.** Shepard, R.L.; Blalock, T.V.; Roberts, M.J. To Dept. of Energy. 30 Jan 1989. USA Patent patent application 7-303,181. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE91016890. Source: OSTI; NTIS; GPO Dep.

This invention is a method and device for direct, non-contact temperature measure of a body. A laser beam is reflected from the surface of the body and detected along with the Planck radiation. The detected signal is analyzed using signal correlation technique to generate an output signal proportional to the Johnson noise introduced into the reflected laser beam as a direct measure of the absolute temperature of the body. 2 figs.

256 **Triaxial thermopile array geo-heat-flow sensor.** Carrigan, C.R.; Hardee, H.C.; Reynolds, G.D.; Steinfort, T.D. To Dept. of Energy. 1990. Filed date 30 Apr 1990. USA Patent patent application 7-516,399. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE92004606. Source: OSTI; NTIS; GPO Dep.

A triaxial thermopile array geothermal heat flow sensor is designed to measure heat flow in three dimensions in a reconstituted or unperturbed subsurface regime. Heat flow can be measured in conductive or permeable convective media. The sensor may be encased in protective pvc tubing and includes a plurality of thermistors and an array of heat flow transducers produce voltage proportional to heat flux along the subsurface regime and permit direct measurement of heat flow in the subsurface regime. The presence of the thermistor array permits a comparison to be made between the heat flow estimates obtained from the transducers and heat flow calculated using temperature differences and Fourier's Law. The device is extremely sensitive with an accuracy of less than 0.1 Heat Flow Units (HFU) and may be used for long term readings. 6 figs.

257 **Temperature monitoring device and thermocouple assembly therefor.** Grimm, N.P.; Bauer, F.I.; Bengel, T.G.; Kothmann, R.E.; Mavretish, R.S.; Miller, P.E.; Nath, R.J.; Salton, R.B. To Dept. of Energy, Washington, DC (United States). USA Patent 5,061,083/A/. 29 Oct 1991. Filed date 19 Jun 1989. USA Patent patent application 7-368,459. Int. Cl. G01K 7/02. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a temperature monitoring device for measuring the temperature at a surface of a body, composed of: at least one first thermocouple and a second thermocouple; support members supporting the thermocouples for placing the first thermocouple in contact with the body surface and for maintaining the second thermocouple at a defined spacing from the body surface; and a calculating circuit connected to the thermocouples for receiving individual signals each representative of the temperature reading produced by a respective one of the first and second thermocouples and for producing a corrected temperature signal having a value which represents the temperature of the body surface and is a function of the difference between the temperature reading produced by the first thermocouple and a selected fraction of the temperature reading provided by the second thermocouple.

258 **Optical heat flux gauge.** Noel, B.W.; Borella, H.M.; Cates, M.R.; Turley, W.D.; MacArthur, C.D.; Cala, G.C. To Dept. of Energy and the Secretary of the Air Force, Washington, DC (United States). USA Patent 5,026,170/A/. 25 Jun 1991. Filed date 7 Jun 1989. USA Patent patent application 7-362,541. Int. Cl. G01K 17/00. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A heat flux gauge is described comprising first and second thermographic phosphor layers separated by a layer of a thermal insulator wherein each thermographic layer comprises respective thermographic phosphors. The gauge may be mounted on a surface with the first thermographic phosphor in contact with the surface. A light source is directed at the gauge, causing the phosphors to luminesce. The luminescence produced by the phosphors is collected and its spectra analyzed in order to determine the heat flux on the surface. First and second phosphor layers must be different materials to assure that the spectral lines collected will be distinguishable.

4406 Optical Instrumentation

Refer also to citation(s) 2, 175, 176, 218, 223

259 **Fiber optic detector.** Partin, J.K.; Ward, T.E.; Grey, A.E. To Dept. of Energy. 1990. Filed date 30 Apr 1990. USA Patent patent application 7-516,590. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE92004609. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a portable fiber optic detector that senses the presence of specific target chemicals by exchanging the target chemical for a fluorescently-tagged antigen that is bound to an antibody which is in turn attached to an optical fiber. Replacing the fluorescently-tagged antigen reduces the fluorescence so that a photon sensing detector records the reduced light level and activates an appropriate alarm or indicator.

260 **Real-time alkali monitoring system.** Goff, D.R.; Romanosky, R.R.; Hensel, P. To Dept. of Energy. 14 Sep 1988. USA Patent patent application 7-244,759. 35p. Sponsored by USDOE, Washington, DC (United States). Order Number DE91017342. Source: OSTI; NTIS; GPO Dep.

A fiber optics based optical emission line monitoring system is provided in which selected emission lines, such as the sodium emission line, may be detected in the presence of interfering background radiation. A combustion flame is fed by a diverted portion of a process stream and the common end of a bifurcated or quadfurcated fiber optic light guide is adapted to collect light from the flame. The light is guided through the branches of the fiber optic cable to bandpass filters, one of which is adapted to each of the branches of the fiber optic light guide. The bandpass filters are centered at wavelengths corresponding to the emission lines to be detected and two separate filters are required for each species being detected. The first filter has a bandwidth of about 3 nms and the second filter has a bandwidth of about 10 nms. Light detectors are located to view the light passing through

the bandpass filters and amplifiers are connected to receive signals from the light detectors. The amplifier corresponding to the bandpass filter having the narrower bandwidth is preset to scale the signal by a factor equal to the ratio of the wide and narrow bandwidths of the bandpass filters. This scaling produces a scaled signal from which the difference between the scaled signal on the other signal can be calculated to produce a signal having an amplitude directly proportional to the concentration of the species of interest and independent of background radiation. 4 figs., 1 tab.

261 **Reflectance based optical fiber chemical sensor.** Butler, M.A.; Pfeifer, K.B.; Ricco, A.J. To Dept. of Energy. 18 Oct 1988. USA Patent patent application 7-259,556. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE91016975. Source: OSTI; NTIS; GPO Dep.

A thin film chemical sensor undergoes changes in reflective optical properties when exposed to a chemical species. A thin metal film is deposited at the end of an optical fiber, and exposure of the thin film to the chemical species causes changes in the effective thickness of the thin film, thereby changing its reflective properties. A chemical detection system based on the thin film sensor includes a light source and an optical divider for dividing light from the light source into a first and second light path. The first light path leads to circuitry for providing a reference signal. The thin film chemical sensor receives light from the second light path, and a photoelectric detector detects light reflected from the chemical sensor and provides an electrical signal representative of the reflected light. Circuitry is provided for comparing the reference signal with the reflected light signal, thereby providing a measurement signal indicative of the presence of the chemical species. 5 figs.

262 **Multilayer diffraction grating.** Barbee, T.W., Jr. To Dept. of Energy. 18 Oct 1988. USA Patent patent application 7-259,564. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE91016976. Source: OSTI; NTIS; GPO Dep.

This invention is for a reflection diffraction grating that functions at x-ray to VUV wavelengths and at normal angles of incidence. The novel grating is comprised of a laminar grating of period D with flat-topped grating bars. A multiplicity of layered synthetic microstructures, of period d and comprised of alternating flat layers of two different materials, are disposed on the tops of the grating bars of the laminar grating. In another embodiment of the grating, a second multiplicity of layered synthetic microstructures are also disposed on the flat faces, of the base of the grating, between the bars. D is in the approximate range from 3000 to 50,000 Angstroms, but d is in the approximate range from 10 to 400 Angstroms. The laminar grating and the layered microstructures cooperatively interact to provide many novel and beneficial instrumentational advantages. 2 figs.

263 **Crystal diffraction lens with variable focal length.** Smither, R.K. To Dept. of Energy. 29 Dec 1988. USA Patent patent application 7-291,916. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE91016884. Source: OSTI; NTIS; GPO Dep.

This invention relates to a method and apparatus for the control of the shape of a planar structure, and in particular to an instrument in which thermal gradients are used to control the shape of the surface of a diffraction crystal. This invention is comprised of a method and apparatus for creating a thermal gradient between the major surfaces of a diffraction crystal and for controlling the shape of the surface of a diffraction crystal so that the crystal will function as a variable focus crystal diffraction lens. 10 figs.

264 **Detection device for hazardous material.** Partin, J.K.; Grey, A.E. To Dept. of Energy. 1990. Filed date 4 Apr 1990. USA Patent patent application 7-504,218. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE92003839. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a detection device that is activated by the interaction of a hazardous chemical with a coating interactive with said chemical on an optical fiber thereby reducing the amount of light passing through the fiber to a light detector. A combination of optical filters separates the light into a signal beam and a reference beam which after detection, appropriate amplification, and comparison with preset internal signals, activates an alarm means if a predetermined level of contaminant is observed.

265 **Laser metrology for coherent multi-telescope arrays.** Shao, M.; Massie, N.A. To Dept. of Energy. 1990. Filed date 16 May 1990. USA Patent patent application 7-524,114. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE92004616. Source: OSTI; NTIS; GPO Dep.

In multi-telescope arrays that comprise multiple telescopes, a beam-combining module, and flat mirrors for directing light beams from the multiple telescopes to the beam combining module, a laser metrology system is used for monitoring various pathlengths along a beam path where deviations are likely. Some pathlengths are defined simply by a pair of retroreflectors or reflectors at both ends. Lengths between pairs of retroreflectors are measured and monitored by laser interferometers. One critical pathlength deviation is related to the displacement of the flat mirror. A reference frame is set up relative to the beam-combining module to form and define the coordinate system within which the positions of the flat mirrors are measured and monitored. In the preferred embodiment, a pair of retroreflectors along the optical axis of the beam-combining module defines a reference frame. A triangle is formed by the reference frame as the base and another retroreflector at the flat mirror as the vertex. The triangle is used to monitor the position of the flat mirror. A beam's pathlength is dynamically corrected in response to the monitored deviations.

266 **High resolution telescope.** Massie, N.A.; Oster, Y. To Dept. of Energy. 1990. Filed date 16 May 1990. USA Patent patent application 7-524,118. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE92004617. Source: OSTI; NTIS; GPO Dep.

A large effective-aperture, low-cost optical telescope with diffraction-limited resolution enables ground-based observation of near-earth space objects. The telescope has a non-redundant, thinned-aperture array in a center-mount, single-structure space frame. It employs speckle interferometric imaging to achieve diffraction-limited resolution. The signal-to-noise ratio problem is mitigated by moving the wavelength of operation to the near-IR, and the image is sensed by a Silicon CCD. The steerable, single-structure array presents a constant pupil. The center-mount, radar-like mount enables low-earth orbit space objects to be tracked as well as increases stiffness of the space frame. In the preferred embodiment, the array has elemental telescopes with subaperture of 2.1m in a circle-of-nine configuration. The telescope array has an effective aperture of 12m which provides a diffraction-limited resolution of 0.02 arc seconds. Pathlength matching of the telescope array is maintained by an electro-optical system employing laser metrology. Speckle imaging relaxes pathlength matching tolerance by one order of magnitude as compared to phased arrays. Many features of the telescope contribute to substantial reduction in costs. These include eliminating the conventional protective dome and reducing on-site construction activities. The cost of the telescope scales with the first power of the aperture rather than its third power as in conventional telescopes. 9 figs., 1 tab.

267 **Solid colloidal optical wavelength filter.** Alvarez, J.L. To Dept. of Energy. 1990. Filed date 30 May 1990. USA Patent patent application 7-530,673. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE92003980. Source: OSTI; NTIS; GPO Dep.

The present invention relates generally to techniques and methods to filter optical wavelengths for spectroscopy, protection from intense radiation, monochromatizing, and analyzing optical radiation, and more particularly to a solid colloidal rejection filter and a method for constructing a solid colloidal rejection filter. A solid colloidal optical wavelength filter includes a suspension of spherical particles dispersed in a coagulable medium such as a setting plastic. The filter is formed by suspending spherical particles in a coagulable medium; agitating the particles and coagulable medium to produce an emulsion of particles suspended in the coagulable medium; and allowing the coagulable medium and suspended emulsion of particles to cool. 3 figs.

268 **Method for eliminating artifacts in CCD imagers.** Turko, B.T.; Yates, G.J. To Dept. of Energy. 1990. Filed date 29 Jun 1990. USA Patent patent application 7-545,732. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098 ;W-7405-ENG-48. Order Number DE92003816. Source: OSTI; NTIS; GPO Dep.

An electronic method for eliminating artifacts in a video camera (10) employing a charge coupled device (CCD) (12) as an image sensor. The method comprises the step of initializing the camera (10) prior to normal read out and includes a first dump cycle period (76) for transferring radiation generated charge into the horizontal register (28) while the decaying image on the phosphor (39) being imaged is being integrated in the photosites, and a second dump cycle period (78), occurring after the phosphor (39) image has decayed, for rapidly dumping unwanted smear charge which has been generated in the vertical registers (32). Image charge is then transferred from the photosites (36) and (38) to the vertical registers (32) and read out in conventional fashion. The inventive method allows the video camera (10) to be used in environments having high ionizing radiation content, and to capture images of events of very short duration and occurring either within or outside the normal visual wavelength spectrum. Resultant images are free from ghost, smear and smear phenomena caused by insufficient opacity of the registers (28) and (32), and are also free from random damage caused by ionization charges which exceed the charge limit capacity of the photosites (36) and (37).

269 **Dual axis translation apparatus and system for translating an optical beam and related method.** Cassidy, K. To Dept. of Energy, Washington, DC (United States). USA Patent 5,061,039/A/. 29 Oct 1991. Filed date 22 Jun 1990. USA Patent patent application 7-542,226. Int. Cl. G02B 7/00. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a dual axis translation device and system in accordance with this invention, for translating an optical beam along both an x- axis and a y-axis which are perpendicular to one another, has a beam directing means acting on the optical beam for directing the beam along a particular path transverse to the x and y axes. An arrangement supporting the beam directing means for movement in the x and y direction within a given plane is provided. The arrangement includes a first means for translating the beam directing means along the x-axis in the given plane in order to translate the beam along the x- axis. The arrangement comprises a second means for translating the beam directing means along the y-axis in the given plane in order to translate the beam along the y- axis.

270 **Video image position determination.** Christensen, W.; Anderson, F.L.; Kortegaard, B.L. To Dept. of Energy, Washington, DC (United States). USA Patent 5,055,926/A/. 8 Oct 1991. Filed date 2 Apr 1990. USA Patent patent application 7-502,959. Int. Cl. H01N 7/18. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes an optical beam position controller in which a video camera captures an image of the beam in its video frames, and conveys those images to a processing board which calculates the centroid coordinates for the image. The image coordinates are used by motor controllers and stepper motors to position the beam in a predetermined alignment. In one embodiment, system noise, used in conjunction with Bernoulli trials, yields higher resolution centroid coordinates.

271 **Spatial optic multiplexer/diplexer.** Tremblay, P.L. To Dept. of Energy, Washington, DC (United States). USA Patent 5,054,018/A/. 1 Oct 1991. Filed date 22 Jun 1990. USA Patent patent application 7-542,215. Int. Cl. H04J 1/00. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

An apparatus is described for simultaneous transmission of optic signals having different wavelengths over a single

optic fiber. Multiple light signals are transmitted through optic fibers that are formed into a circumference surrounding a central core fiber. The multiple light signals are directed by a lens into a single receiving fiber where the light combines and is then focused into the central core fiber which transmits the light to a wavelength discriminating receiver assembly.

272 **Photodetector having high speed and sensitivity.** Morse, J.D.; Mariella, R.P. Jr. To Dept. of Energy, Washington, DC (United States). USA Patent 5,051,804/A/. 24 Sep 1991. Filed date 1 Dec 1989. USA Patent patent application 7-444,339. Int. Cl. H01L 27/14. 6p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

The present invention provides a photodetector having an advantageous combination of sensitivity and speed; it has a high sensitivity while retaining high speed. In a preferred embodiment, visible light is detected, but in some embodiments, x-rays can be detected, and in other embodiments infrared can be detected. The present invention comprises a photodetector having an active layer, and a recombination layer. The active layer has a surface exposed to light to be detected, and comprises a semiconductor, having a bandgap graded so that carriers formed due to interaction of the active layer with the incident radiation tend to be swept away from the exposed surface. The graded semiconductor material in the active layer preferably comprises $Al_{1-x}Ga_xAs$. An additional sub-layer of graded $In_{1-y}Ga_yAs$ may be included between the $Al_{1-x}Ga_xAs$ layer and the recombination layer. The recombination layer is positioned adjacent to the active layer so that carriers from the active layer tend to be swept into the recombination layer.

273 **Multipulsed dynamic moire interferometer.** Deason, V.A. To Dept. of Energy, Washington, DC (United States). USA Patent 5,026,154/A/. 25 Jun 1991. Filed date 6 Oct 1989. USA Patent patent application 7-418,069. Int. Cl. G01L 1/24. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes an improved dynamic moire interferometer comprised of a lasing medium providing a plurality of beams of coherent light, a multiple q-switch producing multiple trains of 100,000 or more pulses per second, a combining means collimating multiple trains of pulses into substantially a single train and directing beams to specimen gratings affixed to a test material, and a controller, triggering and sequencing the emission of the pulses with the occurrence and recording of a dynamic loading event.

4407 Geophysical and Meteorological Instrumentation

Refer also to citation(s) 9

4408 Miscellaneous Instrumentation

Refer also to citation(s) 43, 49, 73, 120, 154, 237, 238

274 **Real time infrared aerosol analyzer.** Johnson, S.A.; Reedy, G.T.; Kumar, R. To Dept. of Energy. 18 Nov 1988. USA Patent patent application 7-273,395. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE91016852. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention consists of an apparatus for analyzing aerosols in essentially real time and includes a virtual impactor which separates coarse particles from fine and ultrafine particles in an aerosol sample. The coarse and ultrafine particles are captured in polytetrafluoroethylene (PTFE) filters, and the fine particles impact onto an internal light reflection element. The composition and quantity of the particles on the PTFE filter and on the internal reflection element are measured by alternately passing infrared light through the filter and the internal light reflection element, and analyzing the light through infrared spectrophotometry to identify the particles in the sample.

275 **Fiber optic geophysical sensors.** Homuth, E.F. To Dept. of Energy. 1990. Filed date 10 Apr 1990. USA Patent patent application 7-506,741. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE92003875. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a fiber optic geophysical sensor in which laser light is passed through a sensor interferometer in contact with a geophysical event, and a reference interferometer not in contact with the geophysical event but in the same general environment as the sensor interferometer. In one embodiment, a single tunable laser provides the laser light. In another embodiment, separate tunable lasers are used for the sensor and reference interferometers. The invention can find such uses as monitoring for earthquakes, and the weighing of objects. 2 figs.

276 **Design and implementation of a dc-based magnetic field controller.** Kotter, D.K.; Rankin, R.A.; Morgan, J.P. To Dept. of Energy. 1990. Filed date 14 May 1990. USA Patent patent application 7-522,877. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE92004615. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a magnetic field controller for laboratory devices and in particular to dc operated magnetic field controllers for mass spectrometers, comprising a dc power supply in combination with improvements to a hall probe subsystem, display subsystem, preamplifier, field control subsystem, and an output stage. 1 fig.

277 **Convergent x-ray monochromator for molecular microprobe analysis.** Gamba, O.O.M. To Dept. of Energy. 1990. Filed date 29 May 1990. USA Patent patent application 7-529,403. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-89PN38014. Order Number DE92004619. Source: OSTI; NTIS; GPO Dep.

An improved apparatus and method are provided for electron spectroscopy for chemical analysis which permits analysis of micron sized regions of a heterogeneous sample surface. The apparatus includes a source of multidirectional X-ray radiation. A hollow cylindrical body receives the multidirectional X-ray radiation. The hollow cylindrical body includes a plurality of beam directing Johannsen-type

diffracting crystals elements arrayed symmetrically and circumferentially around an axis of symmetry extending from the source of X-ray radiation to a surface of the sample. The array of Johannsen-type diffracting crystals transforms the multidirectional X-ray radiation into a hollow cone of monochromatic X-ray radiation that converges on a micron sized region on the sample surface. A screen opaque to X-rays is located along the axis of symmetry between the source of X-ray radiation and the sample. The screen prevents X-rays from the source from reaching the sample without being directed and diffracted by the beam directing and diffracting elements. An electron detector located along the axis of symmetry detects electrons emitted from the micron sized region of the sample surface. The electron detector is located between the X-ray screen and the sample surface. 4 figs.

278 **Method and apparatus for measuring surface contour on parts with elevated temperatures.** Horvath, M.S.; Nance, R.A.; Cohen, G.H.; Fodor, G.E. To Dept. of Energy. 1990. Filed date 31 May 1990. USA Patent patent application 7-531,356. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-76PN00014. Order Number DE92003662. Source: OSTI; NTIS; GPO Dep.

The invention is directed to a method and apparatus for measuring the surface contour of a test piece, such as the bow of a radioactive fuel rod, which is completely immersed in water. The invention utilizes ultrasonic technology and is capable of measuring surface contours of test pieces which are at a higher temperature than the surrounding water. The presence of a test piece at a higher temperature adversely affects the distance measurements by causing thermal variations in the water near the surface of the test piece. The contour measurements depend upon a constant temperature of the water in the path of the ultrasonic wave to provide a constant acoustical velocity (the measurement is made by the time of flight measurement for an ultrasonic wave). Therefore, any variations of water temperature near the surface will introduce errors degrading the measurement. The present invention overcomes these problems by assuring that the supply of water through which the ultrasonic waves travel is at a predetermined and constant temperature. 3 figs.

279 **Method and apparatus for acoustic plate mode liquid-solid phase transition detection.** Blair, D.S.; Frye, G.C.; Hughes, R.C.; Martin, S.J.; Ricco, A.J. To Dept. of Energy. 1990. Filed date 31 May 1990. USA Patent patent application 7-531,492. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE92003778. Source: OSTI; NTIS; GPO Dep.

A method and apparatus for sensing a liquid-solid phase transition event is provided which comprises an acoustic plate mode detecting element placed in contact with a liquid or solid material which generates a high-frequency acoustic wave that is attenuated to an extent based on the physical state of the material in contact with the detecting element. The attenuation caused by the material in contact with the acoustic plate mode detecting element is used to determine the physical state of the material being detected. The method and device are particularly suited for detecting conditions such as the icing and deicing of wings of an aircraft. In another aspect of the present invention, a method is provided wherein the adhesion of a solid material to the detecting element can be measured using the apparatus of the invention. 3 figs.

280 **Fiber-optic voltage sensor.** Wood, C.B. To Dept. of Energy. 1990. Filed date 12 Jul 1990. USA Patent patent application 7-551,834. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP03533. Order Number DE92003823. Source: OSTI; NTIS; GPO Dep.

A fiber optic voltage sensor is described which includes a source of light, a reference fiber for receiving a known percentage of the light and an electrostrictive element having terminals across which is applied, a voltage to be measured. The electrostrictive element is responsive to the applied voltage to assume an altered physical state. A measuring fiber also receives a known percentage of light from the light source and is secured about the electrostrictive element. The measuring fiber is provided with a cladding and exhibits an evanescent wave in the cladding. The measuring fiber has a known length which is altered when the electrostrictive element assumes its altered physical state. A differential sensor is provided which senses the intensity of light in both the reference fiber and the measuring fiber and provides an output indicative of the difference between the intensities.

281 **Resonant ultrasound spectroscopy.** Migliori, A. To Dept. of Energy, Washington, DC (United States). USA Patent 5,062,296/A/. 5 Nov 1991. Filed date 20 Sep 1990. USA Patent patent application 7-585,557. Int. Cl. G01N 29/12. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a resonant ultrasound spectroscopy method which provides a unique characterization of an object for use in distinguishing similar objects having physical differences greater than a predetermined tolerance. A resonant response spectrum is obtained for a reference object by placing excitation and detection transducers at any accessible location on the object. The spectrum is analyzed to determine the number of resonant response peaks in a predetermined frequency interval. The distribution of the resonance frequencies is then characterized in a manner effective to form a unique signature of the object. In one characterization, a small frequency interval is defined and stepped through the spectrum frequency range. Subsequent objects are similarly characterized where the characterizations serve as signatures effective to distinguish objects that differ from the reference object by more than the predetermined tolerance.

45 MILITARY TECHNOLOGY, WEAPONRY, AND NATIONAL DEFENSE

4501 Chemical Explosions and Explosives

Refer also to citation(s) 174

282 Electrical method and apparatus for impelling the extruded ejection of high-velocity material jets. Weingart, R.C. To Dept. of Energy. 27 Apr 1988. USA Patent patent application 7-186,992. 20p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE91017144. Source: OSTI; NTIS; GPO Dep.

A method and apparatus for producing high-velocity material jets is provided. An electric current pulse generator is attached to an end of a coaxial two-conductor transmission line having an outer cylindrical conductor, an inner cylindrical conductor, and a solid plastic or ceramic insulator there between. A coaxial, thin-walled metal structure is conductively joined to the two conductors of the transmission line. An electrical current pulse applies magnetic pressure to and possibly explosively vaporizes metal structure, thereby collapsing it and impelling the extruded ejection of a high-velocity material jet therefrom. The jet is comprised of the metal of the structure, together with the material that comprises any covering layers disposed on the structure. An electric current pulse generator of the explosively driven magnetic flux compression type or variety may be advantageously used in the practice of this invention. 3 figs.

283 Blank fire configuration for automatic pistol. Teague, T.L. To Dept. of Energy. 31 Aug 1988. USA Patent patent application 7-238,450. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE91017337. Source: OSTI; NTIS; GPO Dep.

A pistol configured to fire blank cartridges includes a modified barrel with a breach portion connected to an aligned inner sleeve. Around the inner sleeve, there is disposed an outer sleeve having a vent therein through which the cartridge discharges. The breach portion is connected to a barrel anchor to move backward in a slight arc when the pistol is fired. A spring retaining rod projects from the barrel anchor and receives a coiled recoil spring therearound which recoil spring has one end abutting a stop on the barrel anchor and the other end in abutment with the end of a spring retaining cup. The spring retaining cup is engaged by a flange projecting from the slider so that when the pistol is fired, the slider moves rearwardly against the compression of the spring to eject the spent cartridge and then moves forwardly under the urging of the spring to load a fresh cartridge into the breach portion. The spring then returns all of the slidable elements to their initial position so that the pistol may again be fired. 4 figs.

284 Preparation of 1,3,5-triamino-2,4,6-trinitrobenzene from 3,5-dichloroanisole. Ott, D.G.; Benziger, T.M. To Dept. of Energy. 21 Dec 1988. USA Patent patent application 7-289,653. 16p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE91016883. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Preparation of 1,3,5-triamino-2,4,6-trinitrobenzene (TATB) from 3,5-dichloroanisole. Nitration of 3,5-dichloroanisole under relatively mild conditions gave 3,5-dichloro-2,4,6-trinitroanisole in high yield and purity. Ammonolysis of this latter compound gave the desired TATB. Another route to TATB was through the treatment of the 3,5-dichloro-2,4,6-trinitroanisole with thionyl chloride and dimethylformamide to yield 1,3,5-trichloro-2,4,6-trinitrobenzene. Ammonolysis of this product produced TATB. 4 figs.

285 Tungsten bridge for the low energy ignition of explosive and energetic materials. Benson, D.A.; Bickers, R.W. Jr.; Blewer, R.S. To Dept. of Energy. 20 Dec 1988. USA Patent patent application 7-292,201. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE91016886. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A tungsten bridge device for the low energy ignition of explosive and energetic materials is disclosed. The device is fabricated on a silicon-on-sapphire substrate which has an insulating bridge element defined therein using standard integrated circuit fabrication techniques. Then, a thin layer of tungsten is selectively deposited on the silicon bridge layer using chemical vapor deposition techniques. Finally, conductive lands are deposited on each end of the tungsten bridge layer to form the device. It has been found that this device exhibits substantially shorter ignition times than standard metal bridges and foil igniting devices. In addition, substantially less energy is required to cause ignition of the tungsten bridge device of the present invention than is required for common metal bridges and foil devices used for the same purpose. 2 figs.

286 Laser-driven flyer plate. Paisley, D.L. To Dept. of Energy. 1990. Filed date 2 Apr 1990. USA Patent patent application 7-502,956. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE92003832. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of apparatus for producing high velocity flyer plates involving placing a layer of dielectric material between a first metal foil and a second metal foil. With laser irradiation through an optical substrate, the first metal foil forms a plasma in the area of the irradiation, between the substrate and the solid portion of the first metal foil. When the pressure between the substrate and the foil reaches the stress limit of the dielectric, the dielectric will break away and launch the flyer plate out of the second metal foil. The mass of the flyer plate is controlled, as no portion of the flyer plate is transformed into a plasma. 2 figs.

287 Low profile thermite igniter. Halcomb, D.L.; Mohler, J.H. To Dept. of Energy, Washington, DC (USA). USA Patent 4,996,922/A/. 5 Mar 1991. Filed date 15 Nov 1989. USA Patent patent application 7-436,573. Int. Cl.

F42C 19/08. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a thermite igniter/heat source comprising a housing, high-density thermite, and low-density thermite. The housing has a relatively low profile and can focus energy by means of a torch-like ejection of hot reaction products and is externally ignitable.

54 ENVIRONMENTAL SCIENCES

5401 Environmental Sciences, Atmospheric

Refer also to citation(s) 128, 156, 207, 217

288 Destruction of acid gas emissions. Mathur, M.P.; Fu, Y.C.; Ekmann, J.M.; Boyle, J.M. To Dept. of Energy, Washington, DC (USA). USA Patent 5,020,457/A/. 4 Jun 1991. Filed date 22 Jun 1990. USA Patent patent application 7-541,992. Int. Cl. F23J 11/00. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a method of destroying NO_x and SO_2 in a combustion gas. The method includes generating active species by treating stable molecules in a high temperature plasma. Ammonia, methane, steam, hydrogen, nitrogen or a combination of these gases can be selected as the stable molecules. The gases are subjected to plasma conditions sufficient to create free radicals, ions or excited atoms such as N, NH, NH_2, OH^-, CH and/or CH_2. These active species are injected into a combustion gas at a location of sufficiently high temperature to maintain the species in active state and permit them to react with NO_x and SO_2. Typically the injection is made into the immediate post-combustion gases at temperatures of 475°-950°C.

5402 Environmental Sciences, Terrestrial

Refer also to citation(s) 233

5403 Environmental Sciences, Aquatic

289 Biosorption beads for removal of dissolved metals from aqueous streams. Scott, C.D. To US Dept. of Energy. 21 Jan 1988. USA Patent patent application 7-146,645. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE91017143. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a process for removing heavy metals from aqueous waste streams 5 by contacting such streams with certain biological adsorbents, either living, dead or in fragments, that may be immobilized in gel beads. 1 tab.

290 In-situ remediation system for contaminated groundwater. Corey, J.C.; Looney, B.B.; Kaback, D.S. To Dept. of Energy. 25 Aug 1988. USA Patent patent application 7-236,438. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035 ;AC09-76SR00001. Order Number DE91017331. Source: OSTI; NTIS; GPO Dep.

A system for removing volatile contaminants from a subsurface plume of contamination comprising two sets of wells, a well for injecting a fluid into a saturated zone on one side of the plume and an extracting well for collecting the fluid together with volatilized contaminants from the plume on the other side of the plume is described. The fluid enables the volatile contaminants to be volatilized and carried through the ground to the extracting well. Injecting and extracting wells are preferably horizontal wells positioned below the plume in the saturated zone and above the plume in the vadose zone. The fluid may be air or other gas or a gas and liquid mixture depending on the type of contaminant to be removed and may be preheated to facilitate volatilization. Treatment of the volatilized contamination may be by filtration, incineration, atmospheric dispersion or the like. 3 refs., 3 figs.

291 Aerobic microorganism for the degradation of chlorinated aliphatic hydrocarbons. Fliermans, C.B. To Dept. of Energy. 12 Oct 1988. USA Patent patent application 7-256,429. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE91017353. Source: OSTI; NTIS; GPO Dep.

This invention pertains to a chlorinated aliphatic hydrocarbon-degrading microorganism, having American Type Culture Collection accession numbers ATCC 53570 and 53571, in a biologically pure culture aseptically collected from a deep subsurface habitat and enhanced, mineralizes trichloroethylene and tetrachloroethylene to HCl, H_2O and CO_2 under aerobic conditions stimulated by methane, acetate, methanol, tryptone-yeast extract, propane and propane-methane.

292 Organic contaminant separator. Del Mar, P.; Hemberger, B.J. To Dept. of Energy, Washington, DC (United States). USA Patent 5,037,553/A/. 6 Aug 1991. Filed date 10 Oct 1989. USA Patent patent application 7-418,613. Int. Cl. B01D 15/08. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a process of sample preparation prior to analysis for the concentration of an organic contaminant in an aqueous medium by passing an initial aqueous medium including a minor amount of the organic contaminant through a polyolefin tube having an internal diameter of from about 0.01 to about 2.0 millimeters and being of sufficient length to permit the organic contaminant to adhere to the tube, passing a solvent through the tube, the solvent capable of separating the adhered organic contaminant from the tube. Further, a chromatographic apparatus for sample preparation prior to analysis for the concentration of an organic contaminant in an aqueous medium, the apparatus including a polyolefin tube having an internal diameter of from about 0.01 to about 2.0 millimeters and being of sufficient length to permit an organic contaminant contained within an aqueous medium passed there-through to adhere to the tube is disclosed.

55 BIOMEDICAL SCIENCES, BASIC STUDIES

5502 Biochemistry

Refer also to citation(s) 241

293 Purified oxygen scavenging cell membrane fragments and use of same. Jacobson, K.B.; Adler, H.I. To Dept. of Energy. 18 Oct 1988. USA Patent patent application 7-259,550. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE91016974. Source: OSTI; NTIS; GPO Dep.

A process for purifying oxygen scavenging cell membrane fragments (OSCMF) and the use of same are disclosed. The novel purifying process involves salt precipitation and molecular exclusion chromatography. The unique feature of purified OSCMF is its ability to remove oxygen from organic reaction media and organic preparations without contaminating them to any substantial degree. 1 ref., 2 figs.

294 Improved method for sequencing DNA base pairs. Sessler, A.M.; Dawson, J. To Dept. of Energy. 1990. Filed date 30 May 1990. USA Patent patent application 7-530,693. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE92004622. Source: OSTI; NTIS; GPO Dep.

The base pairs of a DNA structure are sequenced with the use of a scanning tunneling microscope (STM). The DNA structure is scanned by the STM probe tip, and, as it is being scanned, the DNA structure is separately subjected to a sequence of infrared radiation from four different sources, each source being selected to preferentially excite one of the four different bases in the DNA structure. Each particular base being scanned is subjected to such sequence of infrared radiation from the four different sources as that particular base is being scanned. The DNA structure as a whole is separately imaged for each subjection thereof to radiation from one only of each source. 1 ref.

5503 Cytology

295 Flow cytometry apparatus. Pinkel, D. To Dept. of Energy, Washington, DC (USA). USA Patent 4,988,619/A/. 29 Jan 1991. Filed date 30 Nov 1987. USA Patent patent application 7-126,153. Int. Cl. C12Q 1/24. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This paper describes an apparatus for orienting cells in a sheath fluid in a otometer/sorter. It comprises: flow chamber; means for flowing the sheath fluid through the flow chamber along a direction of flow; means for obstructing the flow of the sheath fluid in the flow chamber with a first dimension, which extends substantially across the flow chamber and is substantially perpendicular to the direction of flow and with a thickness perpendicular to the first dimension of the obstructing means wherein the sheath fluid flows around the thickness so that the sheath fluid converges in only one dimension at the downstream edge of the means for obstructing; and means for introducing the cells through the means for obstructing the flow to the region where the sheath fluid converges in only one dimension in the sheath fluid to orient the cells, with an aperture wherein as the cells pass from the means for introducing the cells to the region where the sheath fluid converges the cells pass through the aperture with a cross-sectional length substantially less than or equal to the thickness of the means for obstructing the flow.

5506 Medicine

Refer also to citation(s) 126, 247

296 Nuclear magnetic resonance contrast agents. Smith, P.H.; Brainard, J.R.; Jarvinen, G.D.; Ryan, R.R. To Dept. of Energy. 24 Jan 1989. USA Patent patent application 7-301,678. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE91016889. Source: OSTI; NTIS; GPO Dep.

This invention relates to the field of nuclear magnetic resonance imaging and nuclear magnetic resonance spectroscopy, also known simply as magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS). MRI and MRS are particularly useful in medical research and diagnosis. MRI may be used in addition to x-ray imaging. This invention concerns a family of contrast agents for use in magnetic resonance imaging and a method of enhancing the contrast of magnetic resonance images of an object by incorporating a contrast agent of this invention into the object prior to forming the images or during formation of the images. A contrast agent of this invention is a paramagnetic lanthanide hexaazamacrocyclic molecule, where a basic example has the formula $LnC_{16}H_{14}N_6$. Important applications of the invention are in medical diagnosis, treatment, and research, where images of portions of a human body are formed by means of magnetic resonance techniques. 2 figs.

297 Thiourea derivatives, methods of their preparation and their use in neutron capture therapy of maligant melanoma. Gabel, D. To Dept. of Energy. 27 Jan 1989. USA Patent patent application 7-302,289. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE91017141. Source: OSTI; NTIS; GPO Dep.

Boronated thioureas have been proposed for neutron capture therapy, but no boronated analog has been reported in the literature. The major difficulty in synthesizing such derivatives lies in the properties of the dihydroxylboryl group, which is easily cleaved off organic molecules by either acids or alkali. The aim of the present invention is to provide stable boron-containing thiourea derivatives for neutron capture therapy, and give procedures for their synthesis. 17 refs., 9 figs., 6 tabs.

298 Polarization transfer NMR imaging. Sillerud, L.O.; van Hulsteyn, D.B. To Dept. of Energy. 31 Jan 1989. USA Patent patent application 7-305,311. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE91016891. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A nuclear magnetic resonance (NMR) image is obtained which contains spatial information modulated by chemical information. The modulation results from polarization

transfer due to spin/spin coupling between two atoms; one containing chemical information, and the other containing structural information. First and second rf pulses are provided at separate frequencies for exciting each element, with an imaging gradient applied between pulses to provide spatial separation of the nuclei. The second rf pulse is provided after an interval which is the inverse of the spin coupling constant to select the transfer element nuclei which are spin coupled to the functional element nuclei for imaging. This allows imaging of only the compound of interest and its metabolites. In a particular application, compounds such as glucose, lactose or lactate can be labeled with ^{13}C and metabolic processes involving the compounds can be imaged with the sensitivity of ^{1}H NMR and selectivity of ^{13}C NMR. 7 refs., 3 figs. (MHB)

299 **Acyclonucleosides of 2-nitroimidazole and uses as diagnostic and therapeutic agents.** Srivastava, P.C.; Hasan, A. To Dept. of Energy. 1990. Filed date 18 Jun 1990. USA Patent patent application 7-539,493. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE92003750. Source: OSTI; NTIS; GPO Dep.

An acyclonucleoside of nitroimidazole having the ability to specifically bind to tumor cells and useful for therapy, chemotherapy, imaging and radiosensitizing the tumor cells.

300 **Method of making colloid labeled with radionuclide.** Atcher, R.W.; Hines, J.J. To Dept. of Energy, Washington, DC (United States). USA Patent 5,030,441/A/. 9 Jul 1991. Filed date 11 Sep 1990. USA Patent patent application 7-580,450. Int. Cl. A61K 43/00. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a ferric hydroxide colloid having an alpha-emitting radionuclide essentially on the outer surfaces and a method of forming same. The method includes oxidizing a ferrous hydroxide to ferric hydroxide in the presence of a preselected radionuclide to form a colloid having the radionuclide on the outer surface thereof, and thereafter washing the colloid, and suspending the washed colloid in a suitable solution. The labelled colloid is useful in cancer therapy and for the treatment of inflamed joints.

5507 Microbiology

Refer also to citation(s) 236

5509 Pathology

Refer also to citation(s) 241

5510 Physiological Systems

Refer also to citation(s) 126

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

Refer also to citation(s) 67

5603 Chemicals Metabolism and Toxicology

Refer also to citation(s) 241

58 GEOSCIENCES

Refer also to citation(s) 218

6560 Condensed Matter Physics

301 **Pulsed field sample neutralization.** Appelhans, A.D.; Dahl, D.A.; Delmore, J.E. To US Dept. of Energy, Washington, DC (USA). USA Patent 4,968,888/A/. 6 Nov 1990. Filed date 5 Jul 1989. USA Patent patent application 7-375,442. Int. Cl. G01N 23/00. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an apparatus and method for alternating voltage and for varying the rate of extraction during the extraction of secondary particles, resulting in periods when either positive ions, or negative ions and electrons are extracted at varying rates. Using voltage with alternating charge during successive periods to extract particles from materials which accumulate charge opposite that being extracted causes accumulation of surface charge of opposite sign. Charge accumulation can then be adjusted to a ratio which maintains a balance of positive and negative charge emission, thus maintaining the charge neutrality of the sample.

66 PHYSICS

6612 Techniques of General Use In Physics

Refer also to citation(s) 149

302 **Neutral particle beam sensing and steering.** Maier, W.B.; Cobb, D.D.; Robiscoe, R.T. To Dept. of Energy, Washington, DC (United States). USA Patent 5,043,574/A/. 27 Aug 1991. Filed date 30 Aug 1990. USA Patent patent application 6-574,979. Int. Cl. H05H 3/00. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

The direction of a neutral particle beam (NPB) is determined by detecting Lya radiation emitted during motional quenching of excited H(2S) atoms in the beam during movement of the atoms through a magnetic exit to define an optical axis that intercepts the beam at a viewing angle to include a volume generating a selected number of photons for detection. The detection system includes a lens having an area that is small relative to the NPB area and a pixel array located in the focal plane of the lens. The lens viewing angle and area pixel array are selected to optimize the beam tilt sensitivity. In one embodiment two detectors are placed coplanar with the beam axis to generate a difference signal that is insensitive to beam variations, other than beam tilt.

303 **High brilliance negative ion and neutral beam source.** Compton, R.N. To US DOE, Washington, DC (USA). USA Patent 5,019,705/A/. 28 May 1991. Filed date 3 Jan 1990. USA Patent patent application 7-460,464. Int.

Cl. H01J 3/04. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a high brilliance mass selected (Z-selected) negative ion and neutral beam source having good energy resolution. The source is based upon laser resonance ionization of atoms or molecules in a small gaseous medium followed by charge exchange through an alkali oven. The source is capable of producing microampere beams of an extremely wide variety of negative ions, and milliampere beams when operated in the pulsed mode.

6613 Other Aspects of Physical Science

Refer also to citation(s) 213

6636 Radiation Physics

Refer also to citation(s) 195

6651 Nuclear Techniques In Condensed Matter Physics

Refer also to citation(s) 196

304 **Toroids as NMR detectors in metal pressure probes and in flow systems.** Rathke, J.W. To Dept. of Energy, Washington, DC (United States). USA Patent 5,045,793/A/. 3 Sep 1991. Filed date 31 Jan 1990. USA Patent patent application 7-472,924. Int. Cl. G01R 33/20. 3p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A nuclear magnetic resonance probe is described to measure the properties of a sample under high pressure conditions. The apparatus employs a free standing, elongated toroidal coil as the RF transmitter and receiver.

6653 Interactions Between Beams and Condensed Matter

Refer also to citation(s) 85, 206, 244

6654 Quantum Physics Aspects of Condensed Matter

Refer also to citation(s) 93

305 **Method for the selecting superconducting powders.** Talmy, I.G.; Martin, C.A.; Scharnhorst, K.P. To Dept. of Energy, Washington, DC (United States). USA Patent 5,047,387/A/. 10 Sep 1991. Filed date 19 Jan 1988. USA Patent patent application 7-145,172. Int. Cl. H01L 39/00. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

There is disclosed herein an invention for beneficiation of powered material having superconducting characteristics and processes for carrying it out. The invention involves introducing powdered superconducting material into the vertical field of a magnet wherein particles thereof are levitated according the Meissner Effect. Particles which are more superconducting levitate at higher elevations or states above the magnet than do particles containing phases that are non-superconducting. Particles that are non-superconducting do not react at all in the magnetic field. Levitated particles are selectively harvested from whatever states desired.

306 **Superconducting imaging surface magnetometer.** Overton, W.C. Jr.; van Hulsteyn, D.B.; Flynn, E.R. To US DOE, Washington, DC (USA). USA Patent 5,008,622/A/. 16 Apr 1991. Filed date 21 Dec 1989. USA Patent patent application 7-454,607. Int. Cl. G01R 33/02. 6p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an improved pick-up coil system for use with Superconducting Quantum Interference Device gradiometers and magnetometers involving the use of superconducting plates near conventional pick-up coil arrangements to provide imaging of nearby dipole sources and to deflect environmental magnetic noise away from the pick-up coils. This allows the practice of gradiometry and magnetometry in magnetically unshielded environments. One embodiment uses a hemispherically shaped superconducting plate with interior pick-up coils, allowing brain wave measurements to be made on human patients. Another embodiment using flat superconducting plates could be used in non-destructive evaluation of materials.

6655 Direct Energy Conversion

Refer also to citation(s) 76

70 PLASMA PHYSICS AND FUSION

7004 Fusion Technology

Refer also to citation(s) 107, 118, 130

307 **Microwave measurement of the mass of frozen hydrogen pellets.** Talanker, V.; Greenwald, M. To US Dept. of Energy. 1 Aug 1988. USA Patent patent application 7-226,571. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-78ET51013. Order Number DE91017145. Source: OSTI; NTIS; GPO Dep.

A nondestructive apparatus and method for measuring the mass of a moving object, based on the perturbation of the dielectric character of a resonant microwave cavity caused by the object passing through the cavity. An oscillator circuit is formed with a resonant cavity in a positive feedback loop of a microwave power amplifier. The moving object perturbs the resonant characteristics of the cavity causing a shift in the operating frequency of the oscillator proportional to the ratio of the pellet volume to the volume of the cavity. Signals from the cavity oscillation are mixed with a local oscillator. Then the IF frequency from the mixer is measured thereby providing a direct measurement of pellet mass based upon known physical properties and relationships. This apparatus and method is particularly adapted for the measurement of frozen hydrogen pellets.

308 **Fiber optic mounted laser driven flyer plates.** Paisley, D.L. To Dept. of Energy, Washington, DC (United States). USA Patent 5,029,528/A/. 9 Jul 1991. Filed date 2 Apr 1990. USA Patent patent application 7-502,960. Int. Cl.

F42C 19/00. 2p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

A laser driven flyer plate is described where the flyer plate is deposited directly onto the squared end of an optical fiber. The plasma generated by a laser pulse drives the flyer plate toward a target. In another embodiment, a first metal layer is deposited onto the squared end of an optical fiber, followed by a layer of a dielectric material and a second metal layer. The laser pulse generates a plasma in the first metal layer, but the plasma is kept away from the second metal layer by the dielectric layer until the pressure reaches the point where shearing occurs.

309 **Apparatus having reduced mechanical forces for supporting high magnetic fields.** Prueitt, M.L.; Mueller, F.M.; Smith, J.L. To Dept. of Energy, Washington, DC (USA). USA Patent 4,992,696/A/. 12 Feb 1991. Filed date 17 Feb 1989. USA Patent patent application 7-311,998. Int. Cl. H05H 1/10. 4p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes several configurations of conducting elements capable of supporting extremely high magnetic fields suitable for plasma confinement, wherein forces experienced by the conducting elements are significantly reduced over those which are present as a result of the generation of such high fields by conventional techniques. It is anticipated that the use of superconducting materials will both permit the attainment of such high fields and further permit such fields to be generated with vastly improved efficiency.

99 GENERAL AND MISCELLANEOUS

9902 Mathematics and Computers

Refer also to citation(s) 155, 184

310 **Multichannel signal enhancement.** Lewis, P.S. To Dept. of Energy. 31 Oct 1988. USA Patent patent application 7-264,722. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE91016848. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A mixed adaptive filter is formulated for the signal processing problem where desired a priori signal information is not available. The formulation generates a least squares problem which enables the filter output to be calculated directly from an input data matrix. In one embodiment, a folded processor array enables bidirectional data flow to solve the recursive problem by back substitution without global communications. In another embodiment, a balanced processor array solves the recursive problem by forward elimination through the array. In a particular application to magnetoencephalography, the mixed adaptive filter enables an evoked response to an auditory stimulus to be identified from only a single trial. 7 figs.

311 **Expert overseer for mass spectrometer system.** Filby, E.E.; Rankin, R.A. To US DOE, Washington, DC (USA). USA Patent 5,025,391/A/. 18 Jun 1991. Filed date 4 Apr 1989. USA Patent patent application 7-333,075. Int. Cl. G06F 15/18. 8p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes an expert overseer for the operation and real-time management of a mass spectrometer and associated laboratory equipment. The overseer is a computer-based expert diagnostic system implemented on a computer separate from the dedicated computer used to control the mass spectrometer and produce the analysis results. An interface links the overseer to components of the mass spectrometer, components of the laboratory support system, and the dedicated control computer. Periodically, the overseer polls these devices and as well as itself. These data are fed into an expert portion of the system for real-time evaluation. A knowledge base used for the evaluation includes both heuristic rules and precise operation parameters. The overseer also compares current readings to a long-term database to detect any developing trends using a combination of statistical and heuristic rules to evaluate the results. The overseer has the capability to alert lab personnel whenever questionable readings or trends are observed and provide a background review of the problem and suggest root causes and potential solutions, or appropriate additional tests that could be performed. The overseer can change the sequence or frequency of the polling to respond to an observation in the current data.

9903 Information Handling

Refer also to citation(s) 193

Section III
Other Patents from Technologies Funded by DOE

01 COAL, LIGNITE, AND PEAT

0104 Processing

Refer also to citation(s) 315, 316

312 **Pyrolysis process for producing condensed stabilized hydrocarbons utilizing a beneficially reactive gas.** Durai-Swamy, K. To Occidental Research Corp., Irvine, CA (United States). USA Patent 4,324,642/A/. 13 Apr 1982. Filed date 26 Aug 1980. USA Patent patent application 7-181,597. Int. Cl. C10C 1/00. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a process for producing condensed stabilized hydrocarbons from a solid particulate carbonaceous material. It comprises pyrolyzing a solid particulate carbonaceous feed material at a pyrolysis temperature by introducing the solid particulate carbonaceous feed material, a carbon containing particulate solid source of heat which has been heated to a temperature higher than the pyrolysis temperature and a beneficially reactive gas into a pyrolysis zone, under turbulent flow conditions and under conditions of time and elevated temperature sufficient to produce therefrom a pyrolysis product; separating the particulate solids from a gaseous mixture which comprises the pyrolytic product vapors; contacting the substantially solids-free gaseous mixture stream with a quench fluid comprising a capping agent suitable for stabilizing the newly formed volatilized hydrocarbon free radicals, under predetermined conditions of temperature and flow rate of capping agent sufficient for substantially simultaneously stabilizing substantially all of the newly formed volatilized hydrocarbon free radicals by termination, and substantially simultaneously condensing at least a major portion of the larger hydrocarbons, and separating at least a portion of the condensed stabilized hydrocarbons thusly formed from the gaseous residue.

02 PETROLEUM

0209 Environmental Aspects

Refer also to citation(s) 313

0250 Combustion

313 **Reduced NO_x combustion method.** Delano, M.A. To Union Carbide Corp., Danbury, CT (USA). USA Patent 4,988,285/A/. 29 Jan 1991. Filed date 15 Aug 1989. USA Patent patent application 7-394,036. Int. Cl. F23D 14/00. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a method for combusting fuel and oxidant to achieve reduced formation of nitrogen oxides. It comprises: It comprises: heating a combustion zone to a temperature at least equal to 1500° F.; injecting into the heated combustion zone a stream of oxidant at a velocity within the range of from 200 to 1070 feet per second; injecting into the combustion zone, spaced from the oxidant stream, a fuel stream at a velocity such that the ratio of oxidant stream velocity to fuel stream velocity does not exceed 20; aspirating combustion gases into the oxidant stream and thereafter intermixing the aspirated oxidant stream and fuel stream to form a combustible mixture; combusting the combustible mixture to produce combustion gases for the aspiration; and maintaining the fuel stream substantially free from contact with oxidant prior to the intermixture with aspirated oxidant.

03 NATURAL GAS

0340 Combustion

Refer also to citation(s) 343

04 OIL SHALES AND TAR SANDS

0404 Oil Production, Recovery, and Refining

Refer also to citation(s) 312

05 NUCLEAR FUELS

0504 Feed Processing

314 **Method and means for continuous precipitation of easy-dry, granular uranium peroxide.** Cahil, A.E.; Burkhart, L.E. To Iowa State Univ. Research Foundation, Inc., Ames, IA (United States). USA Patent 5,084,252/A/.

28 Jan 1992. Filed date 20 Sep 1990. USA Patent patent application 7-585,608. Int. Cl. C01G 43/01. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a process of continuously precipitating easy-dry and flowable granular uranium peroxide from high vanadium content solutions. It comprises introducing a uranium mill solution having a high vanadium content with a vanadium to uranium mole ratio up to about 1:2, and a peroxide reactant solution along with a sodium sulfate solution in an outer zone of a reaction precipitation tank which has an interiorly disposed draft tube having open upper and lower ends, and an agitation means for continuous agitation of reacting mill solution within the draft tube; the draft tube defining an outer reaction zone between it and the walls of the precipitation tank and an interior reaction zone within the draft tube; and continuously agitating reacting mill solution within the draft tube to create a down draft of reacting mill solution and peroxide solution which flows out of the lower end of the mill tube upwardly through the outer reaction zone and back into the upper end of the draft tube; and continuously withdrawing from the tank precipitated easy-dry granular uranium peroxide.

09 BIOMASS FUELS

0909 Processing

Refer also to citation(s) 336, 337

10 SYNTHETIC FUELS

1002 Production

315 **Moderated ruthenium Fischer-Tropsch synthesis catalyst.** Abrevaya, H. To UOP, Des Plaines, IL (United States). USA Patent 5,059,574/A/. 22 Oct 1991. Filed date 23 Jul 1990. USA Patent patent application 7-556,247. Int. Cl. B01J 21/02. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a catalyst useful for producing C_3-hydrocarbons from hydrogen and carbon monoxide. It comprises an inorganic oxide support; about 0.3-6.0 wt. percent ruthenium present as particles of about 40-60 Angstroms and about 0.1-5.0 wt. % of a modifier component chosen from the group consisting of aluminum, silicon, lead, arsenic, and bismuth.

316 **Homogeneous catalyst formulations for methanol production.** Mahajan, D.; Sapienza, R.S.; Slegeir, W.A.; O'Hare, T.E. To Associated Universities, Inc., Washington, DC (United States). USA Patent 4,992,480/A/. 12 Feb 1991. Filed date 29 Mar 1990. USA Patent patent application 7-500,935. Int. Cl. C07C 27/06. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a method of producing methanol in a liquid those from synthesis gas. It comprises hydrogen and carbon monoxide contacting the synthesis gas with a homogeneous catalyst dissolved in methanol or methanol and a co-solvent, wherein the catalyst consists of a transition metal carbonyl complex, wherein the transition metal is selected from the group consisting of Cu, Ni, Pd, Co, Ru, Mo, Fe, and mixtures thereof, and an alkoxide.

14 SOLAR ENERGY

1405 Solar Energy Conversion

317 **Electrolytic etch for preventing electrical shorts in solar cells on polymer surfaces.** Weber, M.F. To Minnesota Mining and Manufacturing Co., St. Paul, MN (United States). USA Patent 5,055,416/A/. 8 Oct 1991. Filed date 7 Dec 1988. USA Patent patent application 7-281,099. Int. Cl. H01L 31/18. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This paper describes a method for preparing an amorphous silicon p-i-n solar cell which incorporates a conductive metal layer interposed between an insulating substrate layer and the p layer of the solar cell and a transparent conductive layer overlying the n layer of the solar cell. It comprises: anodically etching any exposed portions of the metal layer, after deposition of the amorphous silicon and prior to application of the transparent conductive layer, to substantially prevent shorts or shunts being formed in the solar cell.

21 NUCLEAR POWER REACTORS AND ASSOCIATED PLANTS

2101 Power Reactors, Nonbreeding, Light-Water Moderated, Boiling Water Cooled

Refer also to citation(s) 322

2102 Power Reactors, Nonbreeding, Light-Water Moderated, Nonboiling Water Cooled

Refer also to citation(s) 322

2105 Power Reactors, Breeding

Refer also to citation(s) 321

22 NUCLEAR REACTOR TECHNOLOGY

2202 Components and Accessories

318 **Passive containment cooling system.** Conway, L.E.; Stewart, W.A. To Westinghouse Electric Corp., Pittsburgh, PA (United States). USA Patent 5,049,353/A/. 17 Sep 1991. Filed date 21 Apr 1989. USA Patent patent application 7-341,442. Int. Cl. G21C 13/00. vp. Source: Patent

and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a passive containment cooling system. It comprises a metal containment shell encasing a reactor core and having a top and inner and outer surfaces; a water supply disposed in an elevated position above the containment shell; a concrete shield building surrounding the containment shell and having a top and inner and outer surfaces; an air inlet formed radially at the top of the shield building; a chimney formed centrally in and extending upwardly from the top of the shield building; an air baffle extending from the top of the shield building over a substantial length of the containment shell and having inner and outer surfaces, a shape substantially conforming to the shape of the containment shell and an open lower end; the inner surface of the shield building and the outer surface of the air baffle forming a first annular space extending from the air inlet to the open end of the air baffle.

2203 Fuel Elements

Refer also to citation(s) 320

2204 Control Systems

319 **Hydroball string sensing system.** Hurwitz, M.J.; Ekeroth, D.E.; Squarer, D. To Westinghouse Electric Corp., Pittsburgh, PA (United States). USA Patent 5,064,603/A/. 12 Nov 1991. Filed date 24 Aug 1989. USA Patent patent application 7-397,824. Int. Cl. G21C 17/00. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a hydroball string sensing system for a nuclear reactor having a core containing a fluid at a fluid pressure. It comprises a tube connectable to the nuclear reactor so that the fluid can flow within the tube at a fluid pressure that is substantially the same as the fluid pressure of the nuclear reactor core; a hydroball string including - a string member having objects positioned therealong with a specified spacing, the object including a plurality of hydroballs, and bullet members positioned at opposing ends of the string member; first sensor means, positioned outside a first segment of the tube, for sensing one of the objects being positioned within the first segment, and for providing a sensing signal responsive to the sensing of the first sensing means.

320 **Hybrid nuclear reactor grey rod to obtain required reactivity worth.** Miller, J.V.; Carlson, W.R.; Yarbrough, M.B. To Westinghouse Electric Corp., Pittsburgh, PA (United States). USA Patent 5,064,607/A/. 12 Nov 1991. Filed date 10 Jul 1989. USA Patent patent application 7-377,492. Int. Cl. G21C 7/103. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a grey rod for use in controlling reactivity of a fuel assembly in a nuclear reactor. It comprises tubular, elongated, cladding selected from the weak neutron absorbing material group consisting of stainless steel, zirconium and inconel; a first cladding insert including pellets selected from the strong, neutron absorbing material group consisting of hafnium, silver- indium-cadmium, and boron carbide; and a second cladding insert including pellets selected from the weak neutron absorbing material group consisting of stainless steel, inconel, zirconium and zircaloy, wherein the first and second inserts extend substantially along the length of the cladding, and wherein pellets from the alternate.

321 **Sodium leak detection system for liquid metal cooled nuclear reactors.** Modarres, D. To Physical Research Inc. USA Patent 5,059,383/A/. 22 Oct 1991. Filed date 12 Apr 1989. USA Patent Application 7-336,725. Int. Cl. G21C 17/00. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a device for detecting sodium leaks from a reactor vessel of a liquid sodium cooled nuclear reactor the reactor vessel being concentrically surrounded by a a containment vessel so as to define an airtight gap containing argon. It comprises: a light source for generating a first light beam, the first light beam having first and second predominant wavelengths, the first wavelength being substantially equal to an absorption line of sodium and the second wavelength being chosen such that it is not absorbed by sodium and argon; an optical multiplexer optically coupled to the light source; optically coupled to the multiplexer, each of the sensors being embedded in the containment vessel of the reactor, each of the sensors projecting the first light beam into the gap and collecting the first light beam after it has reflected off of a surface of the reactor vessel; a beam splitter optically coupled to each of the sensors through the multiplexer, the beam splitter splitting the first light beam into second and third light beams of substantially equal intensities; a first filter dispersed within a path of second light beam for filtering the second wavelength out of the third light beam; first and second detector beams disposed with in the paths of the second and third light beams so as to detect the intensities of the second and third light beams, respectively; and processing means connected to the first and second detector means for calculating the amount of the first wavelength which is absorbed when passing through the argon.

2209 Reactor Safety

322 **Nuclear reactor melt-retention structure to mitigate direct containment heating.** Tutu, N.K.; Ginsberg, T.; Klages, J.R. To Associated Universities, Inc., Washington, DC (United States). USA Patent 5,049,352/A/. 17 Sep 1991. Filed date 15 Oct 1990. USA Patent patent application 7-598,846. Int. Cl. G21C 9/00. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a nuclear reactor melt-retention structure that functions to retain molten core material within a melt retention chamber to mitigate the extent of direct containment heating. The structure being adapted to be positioned within or adjacent to a pressurized or boiling water nuclear reactor containment building at a location such that at least a portion of the melt retention structure is lower than and to one side of the nuclear reactor pressure vessel, and such that the structure is adjacent to a gas escape channel means that communicates between the reactor cavity and the containment building of the reactor. It comprises a

melt-retention chamber, wall means defining a passageway extending between the reactor cavity underneath the reactor pressure vessel and one side of the chamber, the passageway including vent means extending through an upper wall portion thereof. The vent means being in communication with the upper region of the reactor containment building, whereby gas and steam discharged from the reactor pressure vessel are vented through the passageway and vent means into the gas-escape channel means and the reactor containment building.

24 POWER TRANSMISSION AND DISTRIBUTION

2402 Power System Networks, Transmission and Distribution

323 **Planar slot coupled microwave hybrid.** Petter, J.K. To Universities Research Association, Inc., Washington, DC (United States). USA Patent 5,075,647/A/. 24 Dec 1991. Filed date 16 May 1990. USA Patent patent application 7-524,638. Int. Cl. H01P 5/20. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes an apparatus for propagating microwave energy. It comprises a dielectric substrate having first and second opposed faces a first conducting member disposed on the first face of the dielectric substrate including a first portion having a longitudinal center line and terminating at a first end in a first port and having a second end, and second and third portions connected to the second end of the first portion extending away from the center line to terminate at second and third ports respectively; and a ground plane disposed on the second face of the dielectric substrate, the ground plane having a gap therein defining an elongated slot parallel to and opposite the first portion and aligned with the center line for creating a slot coupled section, and arranged for energy propagation between the slot coupled section and a fourth port.

25 ENERGY STORAGE

2509 Batteries

324 **Nickel-hydrogen battery with oxygen with electrolyte management features.** Sindorf, J.F. To Globe-Union, Inc., Milwaukee, WI (United States). USA Patent 5,059,496/A/. 22 Oct 1991. Filed date 23 Mar 1989. USA Patent patent application 7-328,117. Int. Cl. H01M 10/34. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a metal oxide-hydrogen cell or battery having gas and electrolyte management features comprising one or more cell-modules, each cell-module having electrolyte. It comprises a negative electrode; a positive electrode which facilitates oxygen diffusion to the negative electrode; and separator means for separating the positive and negative electrodes and holding electrolyte of ionic conductivity disposed between the negative electrode and a first surface of the positive electrode; and means for enclosing the cell units, maintaining proper alignment of the electrodes and separator means, permitting passage of hydrogen gas therethrough to each negative electrode, and preventing swelling of separator edges, the enclosing means having a surface configuration adapted to allow electrolyte to drain from a surface of each negative electrode.

325 **Cadmium sulfide membranes.** Spanhel, L.; Anderson, M.A. To Wisconsin Alumni Research Foundation, Madison, WI (United States). USA Patent 5,059,346/A/. 22 Oct 1991. Filed date 18 Apr 1989. USA Patent patent application 7-340,101. Int. Cl. C09K 11/54. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a method of making a cadmium sulfide membrane. It comprises preparing a cadmium sulfide colloid by introducing sulfide ions to an aqueous solution of 2.5 $\times$ 10 $_{-3}$M cadmium ions and polyphosphate molecules; concentrating the colloid by removing water from the colloid by concentration until the concentrated colloid has an electrical conductivity which exceeds twenty micro-mhos; drying the concentrated colloid until a solid membrane is produced.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

3201 Buildings

326 **Thermal engine driven heat pump for recovery of volatile organic compounds.** Drake, R.L. To Mechanical Technology Inc., Latham, NY (United States). USA Patent 5,035,117/A/. 30 Jul 1991. Filed date 1 Aug 1990. USA Patent patent application 7-561,458. Int. Cl. F25B 7/00. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes an apparatus for separating volatile organic compounds from a stream of gas. It comprises an internal combustion engine including a rotating shaft; an inert gas generating means for converting at least a portion of exhaust from the internal combustion engine into an inert gas and mixing the inert gas into the stream of gas; heat transfer means for recovering waste heat from the internal combustion engine to heat a portion of the stream of gas; a first and a second refrigeration system operatively connected to the rotating shaft of the internal combustion engine, the first and the second refrigeration systems operating at substantially different temperatures, the first and second refrigeration systems receiving the stream of gas and cooling the stream of gas thereby extracting the volatile organic compounds therefrom.

33 ADVANCED PROPULSION SYSTEMS

3307 Emission Control

Refer also to citation(s) 326

36 MATERIALS

3601 Metals and Alloys

327 **Nickel aluminide alloy for high temperature structural use.** Liu, C.T.; Sikka, V.K. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (USA). USA Patent 5,006,308/A/. 9 Apr 1991. Filed date 9 Jun 1989. USA Patent patent application 7-364,774. Int. Cl. C22C 19/05. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes nickel aluminide alloys including nickel, aluminum, chromium, zirconium and boron wherein the concentration of zirconium is maintained in the range of from about 0.05 to about 0.35 atomic percent to improve the ductility, strength and fabricability of the alloys at 1200° C. Titanium may be added in an amount equal to about 0.2 to about 0.5 atomic percent to improve the mechanical properties of the alloys and the addition of a small amount of carbon further improves hot fabricability.

3602 Ceramics, Cermets, and Refractories

328 **Acoustic plane wave preferential orientation of metal oxide superconducting materials.** Tolt, T.L.; Poeppel, R.B. To ARCH Development Corp., Argonne, IL (United States). USA Patent 5,045,528/A/. 3 Sep 1991. Filed date 28 Sep 1987. USA Patent patent application 7-101,819. Int. Cl. H01L 39/12. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a method of forming a superconducting metal oxide with improved current carrying capacity wherein the superconducting metal oxide has a polycrystalline structure and is anisotropically superconducting having one or more longer crystal axes along which the metal oxide is superconducting. It comprises reducing the superconducting metal oxide to a flake-like, powder form, wherein the metal oxide powder is comprised of particles of single crystals; mixing the metal oxide crystal powder with a liquid so as to form a dispersion of the metal oxide crystals in the liquid; generating a plane pressure wave in a spaced manner from the metal oxide powder; directing the plane pressure wave onto a surface of the metal oxide powder in orienting the metal oxide single crystal particles along a preferential direction such that the one or more longer axes of each of the metal oxide crystals are in general alignment; removing the liquid from the aligned metal oxide crystals; and sintering the metal oxide crystals in converting the superconducting metal oxide to a ceramic form.

329 **Preparation of highly oxidized $RBa_2Cu_4O_8$ superconductors.** Morris, D.E. To The Regents of the Univ. of California, Oakland, CA (USA). USA Patent 5,024,992/A/. 18 Jun 1991. Filed date 22 Jun 1990. USA Patent patent application 7-542,672. Int. Cl. C01B 13/14. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This paper describes a process for producing a superconducting material. It comprises: forming a composition by admixing a compound of a metal selected from the group consisting of yttrium and rare earth metals with a compound of barium and a compound of copper, the compounds selected from the group consisting of oxides, nitrates and carbonates thereof, in relative amounts such that the atomic ratio of the metal to barium to copper in the composition is approximately 1:2:4; heating the composition in an oxygen-containing atmosphere having an oxidizing potential greater than 50% molecular oxygen at a pressure of at least 30 atmospheres to a temperature and for a length of time sufficient to effect interdiffusion of the compounds and the formation of a substantially single phase crystalline or polycrystalline lattice structure having approximately the empirical formula $RBa_2Cu_4O_8$ where R is the metal of compound (i), which lattice structure is temperature stable at temperatures below about 750°C.

330 **Titanium diboride-chromium diboride-yttrium titanium oxide ceramic composition and a process for making the same.** Holcombe, C.E.; Dykes, N.L. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (USA). USA Patent 5,013,694/A/. 7 May 1991. Filed date 20 Apr 1990. USA Patent patent application 7-513,337. Int. Cl. C04B 35/58. 2p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a ceramic composition. The ceramic composition consists essentially of from about 84 to 96 w/o titanium diboride, from about 1 to 9 w/o chromium diboride, and from about 3 to about 15 w/o yttrium-titanium-oxide. A method of making the ceramic composition is also described. The method of making the ceramic composition comprises the following steps: Step 1 - A consolidated body containing stoichiometric quantities of titanium diboride and chromium diboride is provided. Step 2 - The consolidated body is enclosed in and in contact with a thermally insulated package of yttria granules having a thickness of at least 0.5 inches. Step 3 - The consolidated body enclosed in the thermally insulated package of yttria granules is heated in a microwave oven with microwave energy to a temperature equal to or greater than 1,900 degrees centigrade to sinter and uniformly disperse yttria particles having a size range from about 1 to about 12 microns throughout the consolidated body forming a densified body consisting essentially of titanium diboride, chromium diboride, and yttrium-titanium-oxide. The resulting densified body has enhanced fracture toughness and hardness.

3606 Other Materials

Refer also to citation(s) 342

331 **Method of bonding metals to ceramics.** Maroni, V.A. To Arch Development Corp., Chicago, IL (United

States). USA Patent 5,079,223/A/. 7 Jan 1992. Filed date 14 Aug 1990. USA Patent patent application 7-566,780. Int. Cl. C23C 14/34. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a method of forming a composite. It comprises providing a ceramic capable of having zero electrical resistance and complete diamagnetism at superconducting temperatures, bonding a layer of Ag, Au or alloys thereof with the ceramic, pressure bonding a first metal of In or an alloy thereof the to layer of Ag, Au or alloys thereof at a temperature less than the melting point of the In or In alloy, bonding a second metal to the In or In alloy to form a composite wherein the second metal is selected from the class consisting of Al, Cu, Pb and Zn and alloys thereof.

332 **Method for reducing or eliminating interface defects in mismatched semiconductor eiplayers.** Fitzgerald, E.A.; Ast, D.G. To Cornell Research Foundation, Inc., Ithaca, NY (United States). USA Patent 5,032,893/A/. 16 Jul 1991. Filed date 27 Jul 1990. USA Patent patent application 7-560,249. Int. Cl. G01L 29/04; G01L 27/12. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a semiconductor material composite structure formed from crystal lattice mismatched semiconductor materials. It comprises a first semiconductor material layer having a multiplicity of pillars and adjacent wells; and a second semiconductor material layer deposited discontinuously on the first semiconductor pillars and wells to form an interface therewith; wherein the pillars, wells and the discontinuous layer have a lateral dimension from about 2 μm to about 5000 μm; and wherein the second semiconductor is deposited on the pillars and wells in excess of the critical thickness defined as the thickness at which a comparable composite having a lateral measurement of greater than 5000 μm exceeds a dislocation density of 100 dislocations per centimeter.

40 CHEMISTRY

4001 Analytical and Separations Chemistry

333 **Modified resins for solid-phase extraction.** Fritz, J.S.; Sun, J.J. To Iowa State Univ. Research Foundation, Inc., Ames, IA (United States). USA Patent 5,071,565/A/. 10 Dec 1991. Filed date 4 Feb 1991. USA Patent patent application 7-650,289. Int. Cl. B01D 15/04. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a method of analytically determining levels of polar organics in aqueous solutions. It comprises contacting an aqueous solution containing some polar organics with a functionalized polystyrene-divinyl benzene adsorbent resin; the resin being functionalized by organic, neutral hydrophilic groups selected from the group consisting of hydroxy-methyl, acetyl and cyanomethyl, and thereafter; washing the polar organics out of the adsorbent resin with a suitable element, and thereafter; analytically determining the level of polar organics present.

334 **Apparatus and method for transient thermal infrared spectrometry.** McClelland, J.F.; Jones, R.W. To Iowa State Univ. Research Foundation, Inc., Ames, Iowa (United States). USA Patent 5,070,242/A/. 3 Dec 1991. Filed date 2 Jul 1990. USA Patent patent application 7-546,738. Int. Cl. G01N 21/71. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a method for enabling analysis of a material. It comprises cooling a thin surface layer portion of the material to transiently generate a temperature differential between the thin surface layer portion and a lower portion of the material sufficient to alter the thermal infrared emission spectrum of the material from the blackbody thermal infrared emission spectrum of the material; and detecting the altered thermal infrared emission spectrum of the material while the altered thermal infrared emission spectrum is sufficiently free of self-absorption by the material of emitted infrared radiation, prior to the temperature differential propagating into the lower portion of the material to an extent such that the altered thermal infrared emission spectrum is no longer sufficiently free of self-absorption by the material of emitted infrared radiation, so that the detected altered thermal infrared emission spectrum is indicative of characteristics relating to molecular composition of the material.

335 **Selective aqueous extraction of organics coupled with trapping by membrane separation.** van Eikeren, P.; Brose, D.J.; Ray, R.J. To Bend Research, Inc., Bend, OR (United States). USA Patent 5,041,227/A/. 20 Aug 1991. Filed date 9 Oct 1990. USA Patent patent application 7-595,241. Int. Cl. B01D 61/00. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes improvement in an organic/aqueous extraction process for the extraction of an organic solute from an organic solvent or solvent mixture with an aqueous-based extractant. The improvement comprises continuously recycling the aqueous-based extractant through a membrane separation process that selectively removes the organic solute from the aqueous-based extractant, the membrane separation process being selected from at least one of reverse osmosis, nanofiltration, ultrafiltration, membrane distillation, pervaporation, membrane contactor and supported-liquid membrane.

336 **Method for recovering and using lignin in adhesive resins by extracting demethylated lignin.** Schroeder, H.A. To Colorado State Univ. Research Foundation, Ft. Collins, CO (United States). USA Patent 5,026,808/A/. 25 Jun 1991. Filed date 3 Apr 1989. USA Patent patent application 7-332,716. Int. Cl. C08H 5/02. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a method for extracting demethylated lignin from demethylated lignin-containing aqueous solution. It comprises mixing the demethylated lignin-containing aqueous solution with a polar, partially water immiscible organic solvent to form a demethylated lignin-containing aqueous solution/organic solvent mixture;

allowing the demethylated lignin-containing aqueous solution/organic solvent mixture to form at least two phases wherein at least one of the at least two phases is an aqueous phase and at least one of the at least two phases is an organic solvent phase which contains at least a portion of the demethylated lignin which was contained in the demethylated lignin-containing aqueous solution; separating the aqueous phase from the organic solvent phase; and recovering the demethylated lignin contained in the organic solvent phase.

337 **Method for recovering and using lignin in adhesive resins by extracting demethylated lignin.** Schroeder, H.A. To Colorado State Univ. Research Foundation, Ft. Collins, CO (United States). USA Patent 5,021,531/A/. 4 Jun 1991. Filed date 20 Feb 1990. USA Patent patent application 7-483,247. Int. Cl. C08H 5/02. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a method for employing demethylated lignin dissolved in demethylated lignin-containing aqueous solution to produce an adhesive. It comprises mixing a demethylated lignin-containing aqueous solution with a polar, partially water immiscible organic solvent to form a demethylated lignin-containing aqueous solution/organic solvent mixture; allowing the demethylated lignin-containing aqueous solution/organic solvent mixture to form at least two phases wherein at least one of the at least two phases is an aqueous phase and at least one of the at least two phases is an organic solvent phase which contains at least a portion of the demethylated lignin which was contained in the demethylated lignin-containing aqueous solution; separating the aqueous phase from the organic solvent phase; recovering the demethylated lignin contained in the organic solvent phase; and mixing the recovered demethylated lignin with an alkaline material, an aldehyde and an adhesive filter in order to produce an adhesive.

338 **Mass spectroscopic apparatus and method.** Bomse, D.S.; Silver, J.A.; Stanton, A.C. To Southwest Sciences, Inc., Santa Fe, NM (United States). USA Patent 5,015,848/A/. 14 May 1991. Filed date 13 Oct 1989. USA Patent patent application 7-421,281. Int. Cl. B01D 59/44. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a method for producing a two-dimensional mass spectrum of an analyte. It comprises applying to an analyte a reproducible, progressively varying ionization energy; mass filtering the ions generated; detecting and quantifying the mass filtered ions of the components generated as a function of time and producing output signals representative thereof; processing the output signals to provide a two-dimensional mass spectrum representative of at least one component present within the analyte.

339 **Open-split interface for mass spectrometers.** Diehl, J.W. To Und-Scn Foundation, Grand Forks, ND (United States). USA Patent 4,988,870/A/. 29 Jan 1991. Filed date 10 Oct 1989. USA Patent patent application 7-418,675. Int. Cl. H01J 44/00. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes an open-end interface for mass spectrometers. It comprises a connector body having first, second, third and fourth leg members, the first and third legs being generally coaxial and the second and fourth legs being generally coaxial; a first tubular aperture extending through the connector body and the first and third legs; a second tubular aperture extending through the connector body and the second and fourth legs, connected with the first tubular aperature at a juncture within the connector body; a fifth leg projecting from the connector body; a third tubular aperature extending through the fifth leg to the juncture; means for sealably connecting a capillary gas chromatograph to the third leg; a first capillary column end extending from a gas chromatograph, connected to the third leg and extending through the first tubular aperature to the juncture; a flow restrictor tube extending from a mass spectrometer and journaled through the first tubular aperature in the first and third legs.; means for sealably connecting atmospheric pressure-type detectors to the second and fourth legs; and means for sealably connecting a sweep gas tube to the fifth leg.

340 **Method for packing chromatographic beds.** Freeman, D.H.; Angeles, R.M.; Keller, S. To The Univ. of Maryland, College Park, MD (United States). USA Patent 4,985,143/A/. 15 Jan 1991. Filed date 31 Jan 1990. USA Patent patent application 7-472,436. Int. Cl. B01D 15/08. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes process for packing column chromatography beds. It comprises preparing a slurry of chromatographic bed material and a liquid comprising at least one of water, methanol, chloroform and hexane, the bed material being denser than the liquid, introducing the slurry into a column provided with a removable plug at one end and allowing the slurry to settle in the column such that the bed material falls to the plugged end, thereafter centrifuging the column under the condition that the surface of the liquid is at all points and times above the surface of the bed material, with respect to the plugged end, and continuing the centrifuging for a period of time to obtain a predetermined packing level in the bed material in the substantial absence of channeling, removing the plug from the column and allowing the liquid to drain through the bed and out of the column.

341 **Apparatus for purifying arsine, phosphine, ammonia, and inert gases to remove Lewis acid and oxidant impurities therefrom.** Tom, G.M.; Brown, D.W. To Advanced Technology Materials, Inc., New Milford, CT (United States). USA Patent 4,983,363/A/. 8 Jan 1991. Filed date 3 Mar 1988. USA Patent patent application 7-163,792. Int. Cl. B01J 8/02. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes an apparatus for purifying a gaseous mixture. It comprises a primary component selected from the group consisting of arsine, phosphine, ammonia, inert gases, and mixtures thereof, and impurities selected from the group consisting of Lewis acids, oxidants, and mixtures thereof. It comprises a vessel containing a bed of a scavenger, the scavenger comprising: a support having a surface area in the range of from about 50 to about 1000

square meters per gram of support; and associated with, but not covalently bonded to, the support, an anion which is reactive to effect the removal of the impurities from the gaseous mixture, the anion being selected from the group consisting of: carbamions whose corresponding protonated compounds have a pK_a value of from about 22 to about 36; anions formed by reaction of the carbanions with the primary component of the mixture.

342 **Modified clay sorbents.** Fogler, H.S.; Srinivasan, K.R. To Univ. of Michigan, Ann Arbor, MI (United States). USA Patent 4,916,095/A/. 10 Apr 1990. Filed date 14 Jul 1988. USA Patent patent application 7-219,091. Int. Cl. B01J 21/16. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a clay-based sorbent. It comprises a clay having an external surface and lamellar layers; and cationic surfactant ions having a hydrocarbon portion and a cationic head portion, the cationic surfactant ions being irreversibly bound to the external surface by the hydrocarbon portion. This patent also describes cetylpyridinium-aluminum hydroxy-montmorillonite; the clay-based sorbent wherein the clay is a non-expandable clay; and the clay-based sorbent wherein the cationic surfactant ions are selected from the group consisting of ionized cetylpyridinium chloride and cetylakonium chloride.

42 ENGINEERING

4202 Facilities, Equipment, and Techniques

Refer also to citation(s) 341

343 **Porous radiant burners having increased radiant output.** Tong, T.W.; Sathe, S.B.; Peck, R.E. To Arizona Board of Regents, Tempe, AZ (USA). USA Patent 4,977,111/A/. 11 Dec 1990. Filed date 4 Aug 1989. USA Patent patent application 7-389,542. Int. Cl. C04B 35/76. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes a porous radiant burner. It comprises a mold consisting of bound predried heat-cured sub-micron diameter ceramic fibers.

344 **Textural break foundation wall construction modules.** Phillips, S.J. To Westinghouse Electric Corp., Pittsburgh, PA (United States). USA Patent 4,974,379/A/. 4 Dec 1990. Filed date 6 Dec 1989. USA Patent patent application 7-446,748. Int. Cl. B09B 1/00. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a below-grade, textural-break foundation wall structure for inhibiting diffusion and advection of liquids and gases into and from a surrounding hydrogeologic environment, It comprises a foundation wall having an interior and exterior surface thereon; porous medium means disposed around a portion of the exterior surface; modular barrier means disposed around a portion of the porous medium means, the modular barrier means being substantially removable from the hydrogeologic environment; wherein the foundation wall comprises guide means having an anchor portion secured to and partially embedded into the foundation wall for permitting removable attachment of the modular barrier means to the foundation was; and a porous geotextile material disposed between the porous medium means and the modular barrier means for providing substantial discontinuity between the hydrogeologic environment and the porous medium means upon removal of the modular barrier means.

345 **Abrasive swivel assembly and method.** Hashish, M.; Marvin, M. To Flow Industries, Inc., Kent, WA (United States). USA Patent 4,936,059/A/. 26 Jun 1990. Filed date 25 May 1989. USA Patent patent application 7-357,060. Int. Cl. B24C 5/04. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes an assembly for providing a rotating, particle-laden fluid jet. It comprises tube means including a straight inner tube for containing within its interior a stream of particle-free fluid which flows from an upstream pressured source of the fluid through the inner tube and out the downstream end of the tube, the tube means also including a straight tubular section surrounding the inner tube; means for rotating the straight tubular section of the tube means about the longitudinal axis of the straight tubular section; means for introducing solid particles into the at a point along the rotating straight tubular section so as to cause the particles to mix with the fluid stream at the downstream end of the tube, whereby to produce particle-laden fluid stream; and means for forming a rotating jet from the particle-laden stream; and the straight tubular section of the tube means including a pair of spaced apart longitudinal subsections having confronting flanges and bolts coupling the flange means and therefore the subsections for rotation by the rotating means.

346 **Process and composition for drying of gaseous hydrogen halides.** Tom, G.M.; Brown, D.W. To Advanced Technology Materials, Inc., New Milford, CT (United States). USA Patent 4,853,148/A/. 1 Aug 1989. Filed date 24 Mar 1987. USA Patent patent application 7-29,631. Int. Cl. C09K 3/00. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a scavenger, having utility for drying a gaseous hydrogen halide of the formula HX, wherein X is selected from the group consisting of bromine, chlorine, fluorine, and iodine, to remove water impurity therefrom and produce an essentially completely water-free gaseous hydrogen halide effluent characterized by residual water concentration of below 0.1 part per million by volume (ppm), the scavenger comprising: a support; and associated with the support an active scavenging moiety selected from one or more members of the group consisting of: metal halide compounds dispersed in the support, of the formula MX_y; metal halide pendant functional groups, of the formula $-MX_{y-1}$, covalently bonded to the support. This patent describes an apparatus for drying a gaseous hydrogen halide of the formula HX, wherein X is selected from the group consisting of bromine, chlorine, fluorine, and iodine, to remove water impurity therefrom, comprising: a vessel containing a bed of a scavenger according to the above claim; means for introducing the water impurity-containing gaseous hydrogen halide to the vessel for passage through

the bed therein; and means for discharging water impurity-depleted gaseous hydrogen halide from the vessel.

4204 Heat Transfer and Fluid Flow

Refer also to citation(s) 319

4210 Combustion Systems

347 Sealed rotary hearth furnace with central bearing support. Docherty, J.P.; Johnson, B.E.; Beri, J. To Salem Furnace Co., Pittsburgh, PA (United States). USA Patent 4,834,650/A/. 30 May 1989. Filed date 14 Jun 1988. USA Patent patent application 7-206,526. Int. Cl. F27B 9/16. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a rotary hearth furnace. It comprises a stationary furnace wall with connecting roof and floor defining a closed furnace chamber therein; a rotatable hearth within the furnace chamber having a gas perforate surface for supporting a charge material thereon and having an open center region; a vertical cylindrical conduit supporting the hearth and communicating with the open center region thereof, the vertical cylindrical conduit extending from the hearth downwardly through an opening formed in the furnace floor and the vertical cylindrical conduit supported for rotation on bearing means positioned beneath the furnace floor; sealing means associated with the vertical cylindrical conduit and the furnace floor to seal off the opening therebetween; drive means for rotating the vertical cylindrical conduit and the hearth, feed means extending into the furnace chamber for charging particulate material onto the hearth, means for supplying hot gases to the furnace chamber between the hearth and the floor; means for withdrawing spent gas from the furnace chamber above the hearth; rabble means for moving the charge material across the hearth for discharge into the open enter region and the vertical cylindrical conduit.

4260 Components, Electron Devices and Circuits

348 Method of making high breakdown voltage semiconductor device. Arthur, S.D.; Temple, V.A.K. To General Electric Co., Schenectady, NY (United States). USA Patent 4,927,772/A/. 22 May 1990. Filed date 30 May 1989. USA Patent patent application 7-358,057. Int. Cl. H01L 21/26. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes improvement in the process of fabricating a semiconductor device including, when complete, at least one P-N junction, a first region of semiconductor material of one conductivity type having an upper surface and forming one side of the junction, a second region of semiconductor material having a lower surface and forming the other side of the junction, the second region being formed within the first region with conductivity type opposite that of the first region; and wherein the P-N junction includes a terminated portion at the upper surface of the first region, the second region includes a graded region adjacent to termination of the P-N junction, and the first region at a width W_D when the junction is reverse-biased to its ideal breakdown voltage; the improvement comprises: forming a first mask of not so uniform thickness on the semiconductor device adjacent to the terminated portion to be used in forming a junction termination extension region; simultaneously doping the first and second portions of the first region through the first mask with the same concentration of dopant to form in the first region, a first zone contiguous with the terminated portion and a second zone adjacent the first zone; forming a second mask of not so uniform thickness on the semiconductor device adjacent the terminated portion and remote from the balance of the junction termination extension region, to be used in forming the second region including the graded region; simultaneously doping the first and second portions of the first region through the second mask with the same concentration of dopant to form in the first region the second region such that the second region has a first zone contiguous with the terminated portion and a second zone adjacent the first zone; and simultaneously diffusing the junction termination extension implant and the second region dopant implant.

43 PARTICLE ACCELERATORS

4303 Auxiliaries and Components

349 Resistor holder. Broodhurst, J.H. To Sysmed, Inc., Golden Valley, MN (United States). USA Patent 4,862,135/A/. 29 Aug 1989. Filed date 29 Sep 1988. USA Patent patent application 7-250,609. Int. Cl. H01C 1/06. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a resistor device for use with an electrostatic particle accelerator having apertured axially spaced apart electrode plates and annular insulators, each insulator being positioned between a pair of electrode plates. It comprises an elongate tubular housing formed of electrically conductive material, fixed end cap formed of conductive material and being connected to one end of the tubular housing, movable end cap formed of conductive material spaced radially inwardly and projecting interiorly of the tubular housing at the other end of the latter, and elongate cylindrical resistor element, means engaging the resistor element and positioning the latter in inwardly spaced concentric relation within the tubular housing, resilient means in the tubular housing engaging the fixed end cap and the resistor element for permitting yieldable axial movement of the latter relative to the housing, an annular conducting element electrically connected to the other end of the tubular housing and being spaced radially outwardly of the movable cap and defining an annular spark gap with the latter, and means electrically connecting the ends of the resistor element with the movable fixed end caps.

44 INSTRUMENTATION

4401 Radiation Instrumentation

350 Method for detecting radiation dose utilizing thermoluminescent material. Miller, S.D.; McDonald, J.C.; Eichner, F.N.; Tomeraasen, P.L. To Battelle Memorial Inst., Richland, WA (USA). USA Patent 5,025,159/A/. 18 Jun 1991. Filed date 11 Oct 1989. USA Patent patent application 7-420,293. Int. Cl. G01T 1/115. 5p. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (USA).

This patent describes the amount of ionizing radiation to which a thermoluminescent material is exposed that is determined by first cooling the thermoluminescent material to a cryogenic temperature. The thermoluminescent material is then optically stimulated by exposure to ultraviolet light. Visible light emitted by the thermoluminescent material as it is allowed to warm up to room temperature is detected and counted. The thermoluminescent material may be annealed by exposure to ultraviolet light.

4408 Miscellaneous Instrumentation

Refer also to citation(s) 334, 338, 339, 340

54 ENVIRONMENTAL SCIENCES

5401 Environmental Sciences, Atmospheric

Refer also to citation(s) 313, 326

66 PHYSICS

6654 Quantum Physics Aspects of Condensed Matter

351 Active superconducting devices formed of thin films. Martens, J.S.; Beyer, J.B.; Nordman, J.E.; Hohenwarter, G.K.G. To Wisconsin Alumni Research Foundation, Madison, WI (United States). USA Patent 5,019,721/A/. 28 May 1991. Filed date 18 Aug 1989. USA Patent patent application 7-395,965. Int. Cl. H03K 3/38. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes a controllable active superconducting device. It comprises a main conduction channel formed of a film of superconductor on a substrate; an active weak link region interposed sin the main conduction channel, the active weak link region composed of a plurality of links formed of a thin film of superconductor separated by non-superconductive voids, the thickness and lateral dimensions of the links selected such that magnetic flux can propagate across the weak link region when it is superconducting means for providing a magnetic flux to the active weak link region which can propagate across the weak link region to control the resistance of the weak region.

70 PLASMA PHYSICS AND FUSION

7004 Fusion Technology

352 Method of and apparatus for accelerating a projectile. Goldstein, Y.S.A.; Tidman, D.A. To GT Devices, Alexandria, VA (United States). USA Patent 4,590,842/A/. 27 May 1986. Filed date 1 Mar 1983. USA Patent patent application 7-471,215. Int. Cl. F41F 1/00. vp. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (United States).

This patent describes an apparatus for accelerating a projectile comprising means forming a confined path having a longitudinal axis along which the projectile traverses, and means for supplying a pulsed high pressure, high velocity plasma jet to the path from outside the path and to the rear of the projectile as the projectile traverses the path to accelerate the projectile along the path, the jet entering the confined path at a non-zero acute angle relative to the confined path axis, the projectile and confined path geometries being such that the plasma to the rear of the projectile has a tendency to leak around the projectile so the leaked plasma is in front of the projectile, the plasma in front of the projectile tending to accumulate and to impede the acceleration of the projectile, and means for venting the plasma in front of the projectile from the confined path to substantially overcome the tendency of the leaked plasma to accumulate and impede the projectile acceleration. This patent also describes an apparatus for accelerating a projectile comprising means forming a confined path having a longitudinal axis along which the projectile traverses, and means for supplying a pulsed high pressure, high velocity plasma jet to the path from outside the path and to the rear of the projectile as the projectile traverses the path to accelerate the projectile along the path, the jet entering the confined path at a non-zero acute angle relative to the confined path axis.

353 Ignition of deuterium-tritium fuel targets. Musinski, D.L.; Mruzek, M.T. To KMS Fusion, Inc., Ann Arbor, MI (USA). 27 Aug 1991. Filed date 18 Dec 1989. USA Patent patent application 7-451,607. vp. Source: Patent and Trademark Office. Box 9, Washington, DC 20232 (USA).

This patent describes a method of igniting a deuterium-tritium (DT) fuel target to obtain fuel burn. It comprises providing a fuel target that includes a hollow spherical shell having a frozen layer of DT material at substantially uniform thickness and cryogenic temperature around the interior surface of the shell, heating the fuel target uniformly to at least partially melt the frozen layer and form a liquid single phase layer or a mixed liquid/solid bi-phase layer of substantially uniform thickness around the interior surface, and directing ignition energy onto the target from exteriorly of the target with the layer in the substantially uniform single or bi-phase state to ignite the DT layer.

Inventor Index

In this index the name of the individual to whom a patent was granted is indexed in the form appearing in the publication cited. In cases where the patent was granted in more than one name, an entry is provided for each inventor. The entry for the primary inventor (first inventor listed on the abstracted document) includes the full document title, abstract number, and the patent number which is given in parentheses. Entries for other inventors provide a cross-reference to the first inventor entry. Accent marks are not input because of computer alphabetization. Spelling and transliteration follow standard conventions.

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Subject Index

This index is arranged by subject descriptors selected from those assigned to each citation in Section II. Patents Available for Licensing from DOE and Section III. Other Patents from Technologies Funded by DOE of this publication. Subject descriptors are selected from a controlled thesaurus of terms, *International Energy: Subject Thesaurus* (ETDE/PUB-2). In order to enhance indexing, subject descriptor entries generally consist of a pair of descriptors: a main term and a qualifier term. Each entry includes the full title, the abstract number, and the patent number which is given in parentheses.

Index entries are selected to indicate the important ideas and concepts presented in a patent. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. *See* references are included to guide users from synonymous terms to the descriptors selected for the concept. *See also* references indicate subject concepts that are more specific than a particular descriptor. To gain complete subject coverage, all such terms should be reviewed.

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4,992,254/A/	91:00000173	5,024,602/A/	91:00000234	5,059,496/A/	91:00000324
4,992,480/A/	91:00000316	5,024,647/A/	91:00000073	5,059,574/A/	91:00000315
4,992,643/A/	91:00000132	5,024,992/A/	91:00000329	5,061,039/A/	91:00000269
4,992,696/A/	91:00000309	5,025,129/A/	91:00000094	5,061,083/A/	91:00000257
4,993,477/A/	91:00000131	5,025,159/A/	91:00000350	5,062,186/A/	91:00000199
4,994,706/A/	91:00000205	5,025,391/A/	91:00000311	5,062,296/A/	91:00000281
4,995,260/A/	91:00000210	5,026,154/A/	91:00000273	5,064,603/A/	91:00000319
4,995,420/A/	91:00000204	5,026,170/A/	91:00000258	5,064,607/A/	91:00000320
4,995,916/A/	91:00000078	5,026,259/A/	91:00000119	5,070,242/A/	91:00000334
4,995,947/A/	91:00000172	5,026,808/A/	91:00000336	5,071,565/A/	91:00000333
4,995,948/A/	91:00000130	5,026,927/A/	91:00000086	5,075,647/A/	91:00000323
4,995,954/A/	91:00000171	5,027,377/A/	91:00000250	5,079,223/A/	91:00000331
4,995,985/A/	91:00000077	5,029,528/A/	91:00000308	5,084,252/A/	91:00000314
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4,997,597/A/	91:00000083	5,032,893/A/	91:00000332	7-226,571	91:00000307
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5,002,723/A/	91:00000097	5,035,769/A/	91:00000126	7-232,200	91:00000148
5,003,544/A/	91:00000239	5,035,854/A/	91:00000127	7-233,511	91:00000149
5,006,142/A/	91:00000169	5,037,553/A/	91:00000292	7-235,078	91:00000206
5,006,306/A/	91:00000129	5,037,606/A/	91:00000070	7-235,079	91:00000182

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7-237,203	91:00000207	7-276,188	91:00000137	7-522,016	91:00000193
7-237,263	91:00000115	7-277,085	91:00000154	7-522,877	91:00000276
7-238,448	91:00000135	7-279,694	91:00000110	7-524,114	91:00000265
7-238,450	91:00000283	7-281,158	91:00000122	7-524,118	91:00000266
7-238,661	91:00000072	7-281,729	91:00000138	7-525,572	91:00000179
7-239,584	91:00000213	7-283,440	91:00000155	7-529,403	91:00000277
7-243,534	91:00000214	7-284,222	91:00000156	7-530,513	91:00000222
7-244,758	91:00000059	7-288,349	91:00000181	7-530,672	91:00000247
7-244,759	91:00000260	7-289,287	91:00000139	7-530,673	91:00000267
7-244,779	91:00000116	7-289,653	91:00000284	7-530,693	91:00000294
7-246,062	91:00000183	7-291,916	91:00000263	7-531,355	91:00000096
7-249,814	91:00000184	7-292,201	91:00000285	7-531,356	91:00000278
7-249,815	91:00000215	7-293,846	91:00000157	7-531,363	91:00000142
7-250,591	91:00000150	7-300,863	91:00000140	7-531,487	91:00000194
7-250,592	91:00000120	7-301,678	91:00000296	7-531,492	91:00000279
7-250,672	91:00000185	7-302,289	91:00000297	7-531,722	91:00000060
7-251,484	91:00000151	7-303,181	91:00000255	7-532,545	91:00000106
7-251,485	91:00000186	7-305,311	91:00000298	7-534,897	91:00000195
7-253,633	91:00000109	7-428,536	91:00000141	7-535,007	91:00000161
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7-256,429	91:00000291	7-502,956	91:00000286	7-539,392	91:00000162
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7-256,432	91:00000217	7-504,152	91:00000190	7-540,240	91:00000248
7-256,839	91:00000218	7-504,217	91:00000158	7-542,604	91:00000178
7-258,543	91:00000152	7-504,218	91:00000264	7-543,897	91:00000143
7-259,389	91:00000121	7-504,223	91:00000085	7-545,732	91:00000268
7-259,550	91:00000293	7-506,125	91:00000076	7-546,827	91:00000196
7-259,556	91:00000261	7-506,126	91:00000191	7-547,370	91:00000124
7-259,564	91:00000262	7-506,741	91:00000275	7-547,748	91:00000243
7-259,634	9' 00000093	7-509,121	91:00000245	7-551,387	91:00000197
7-260,347	91:00000081	7-511,372	91:00000254	7-551,834	91:00000280
7-260,756	91:00000219	7-511,684	91:00000123	7-554,728	91:00000118
7-260,757	91:00000153	7-513,657	91:00000159	7-559,030	91:00000224
7-262,632	91:00000188	7-515,307	91:00000192	7-559,234	91:00000163
7-264,722	91:00000310	7-516,399	91:00000256	7-560,666	91:00000061
7-269,410	91:00000136	7-516,400	91:00000177	7-560,667	91:00000249
7-271,967	91:00000075	7-516,401	91:00000246		
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