

Uvisel

Spectroscopic Phase Modulated Ellipsometer

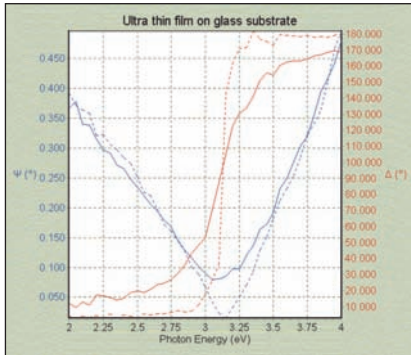
Thin Film,
Surface and Interface
Characterization



Film Thickness

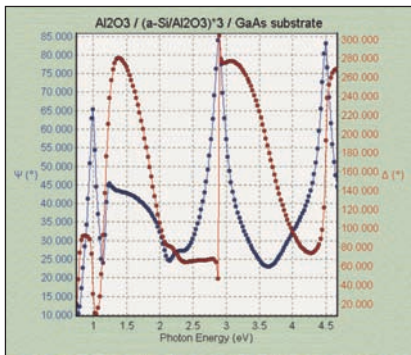
- Accurate thin film measurement from a few angstroms to several microns
- For single layer or complex multilayer stacks

High sensitivity to ultra-thin films



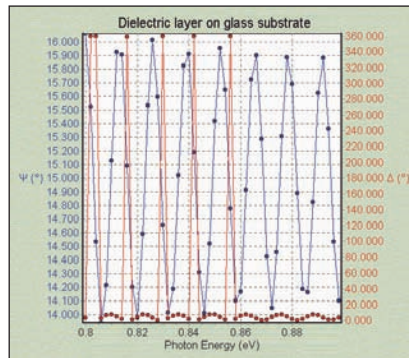
— Ultra-thin monolayer
 - - - Fused silica substrate

Change in signal for 10 Å thick monolayer at the Brewster angle



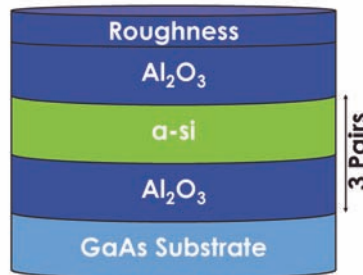
Optically pumped semiconductor laser structure

High resolution monochromator configuration



Ultra-thick dielectric layer (32µm)

Complex multilayer stack analysis



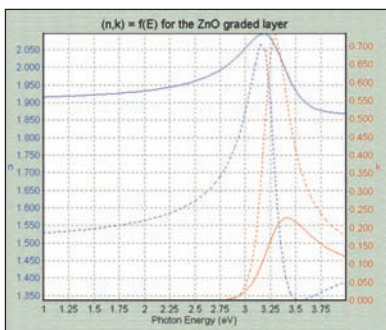
**Spectroscopic
 Ellipsometry:
 Extensive
 Capabilities**



Optical Properties

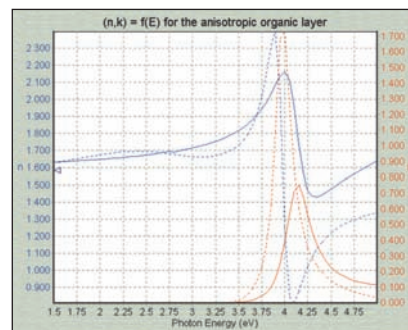
- Refractive index (n) and extinction coefficient (k) from the far-UV to near-IR for complex materials, graded and anisotropic layers

(n,k) Evolution for a graded layer



ZnO thin film

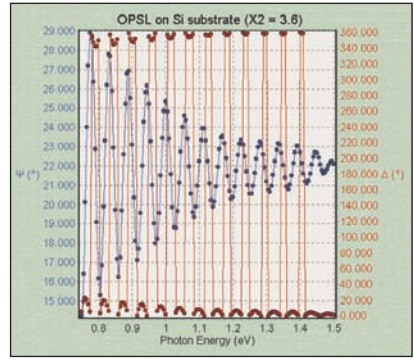
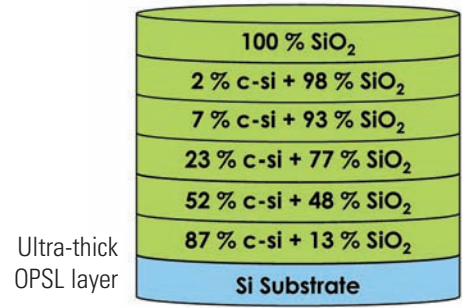
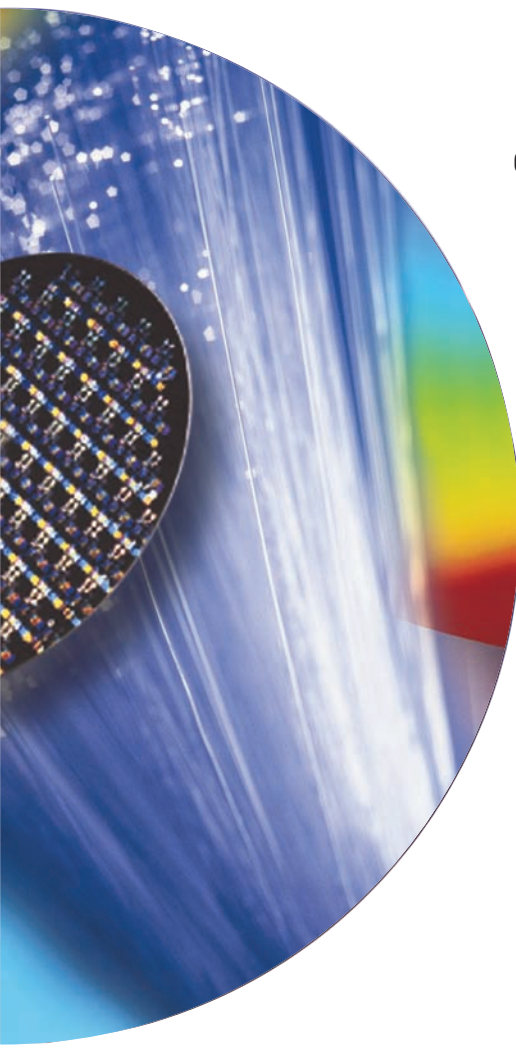
Anisotropic layer characterization



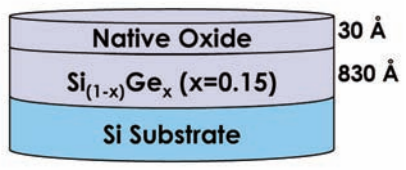
Organic film

- Composition / crystallinity
- Microstructure
- Film uniformity by area and depth

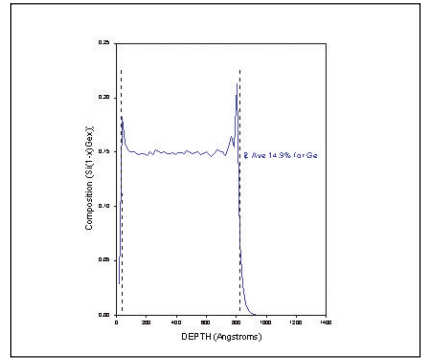
Inhomogeneity over depth: material proportion determination using EMA



Ge concentration determination

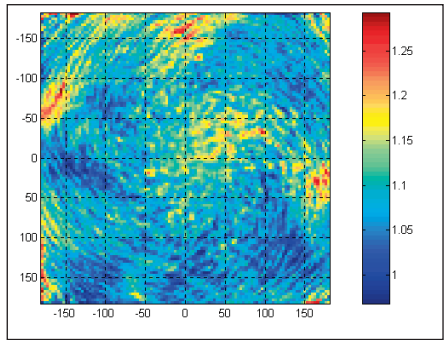


Excellent correlation between SIMS and ellipsometry



Automated sample mapping for area uniformity

2D sample view

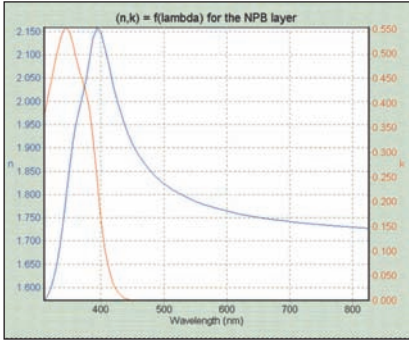


A Concentration of Advantages

- Non-destructive technique
- Highly accurate & reproducible
- Can be used in any transparent and semi-transparent medium
- No reference material necessary
- Very sensitive, especially to ultra-thin films (< 10 nm)
- Simultaneous multiple parameter determination
- Measures data at wavelength of interest

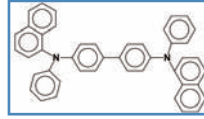


Chemistry & Biology

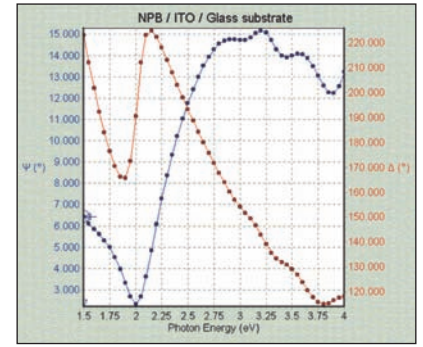


- Polymers
- Langmuir Blodgett films
- Liquid
- Lipids, protein adhesion

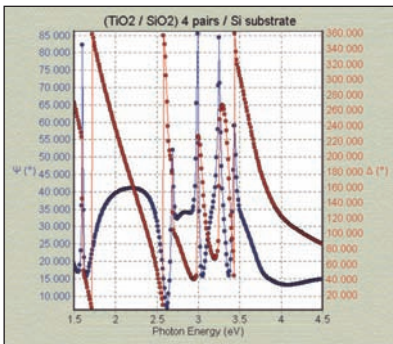
OLED application



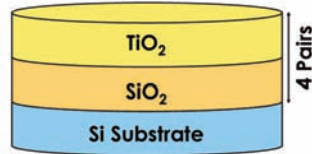
NPB electroluminescent organic film on ITO on glass substrate



Optical Coatings



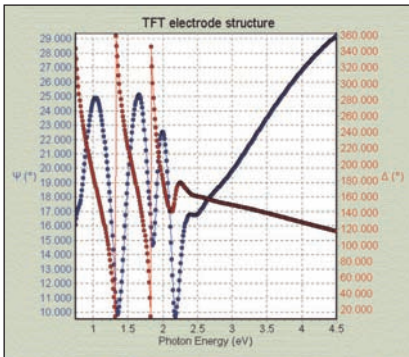
- Wave guides
- Laser mirrors, AR
- Photovoltaic applications



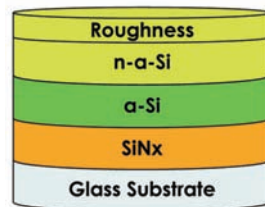
Anti-reflective coating application



Flat Panel Displays



- Oxides, nitrides (ITO, MgO, TaO_x, Al₂O₃, SiN_x...)
- Amorphous silicon, polysilicon
- Colour filters
- Resist

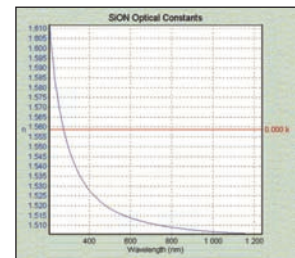
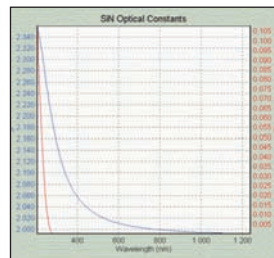
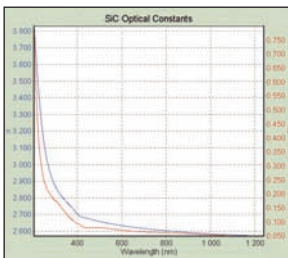


Flat Panel Display application



Dielectric Materials

- Nitrides, oxides, fluorides, carbides

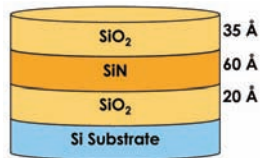


Widest
Ellipsometry
Applications
Database

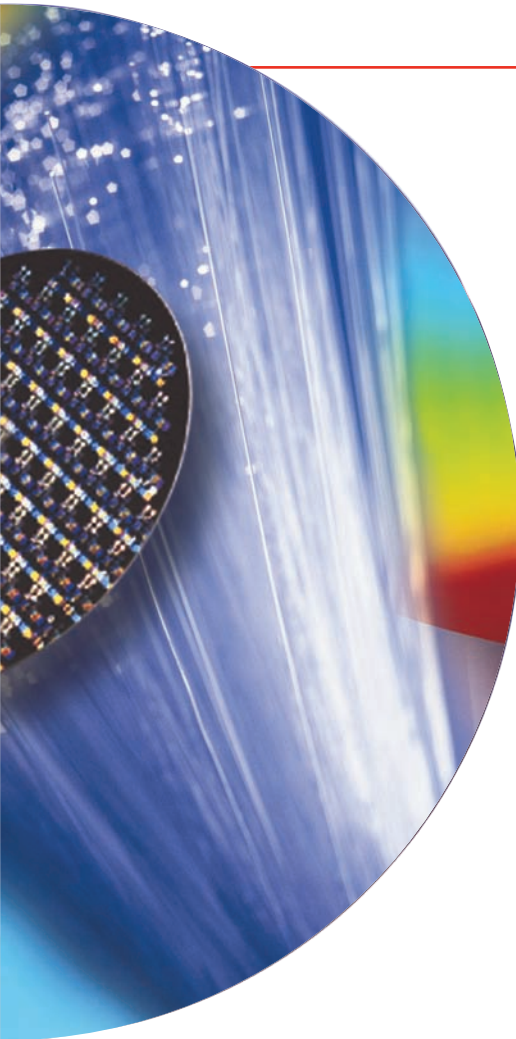
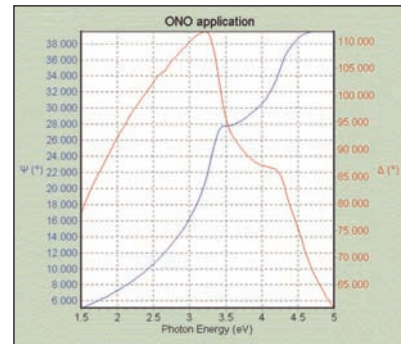
Semiconductor Technology



- Oxides, nitrides, oxinitrides
- Thin NO capacitors, ONO, OPO, ONOPO
- SOI, SIMOX
- Metals (Ti, TiN, TaN, MoSi, WSi_x, Al, Cu, Co...)
- Photoresists, ARC
- High k, low k



ONO application

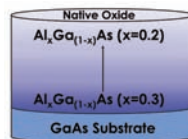


Alloys

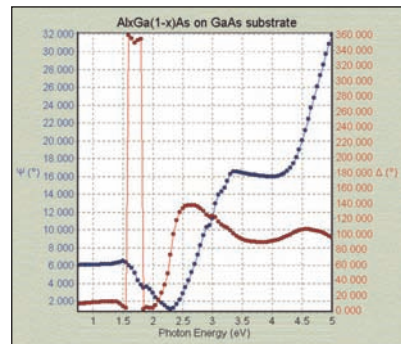


- Si_(1-x)Ge_(x), Hg_(1-x)Cd_(x)Te
- Al_(x)Ga_(1-x)As, InGaAsP
- Superlattices and MQW

Determination of alloy gradient composition



III-V application

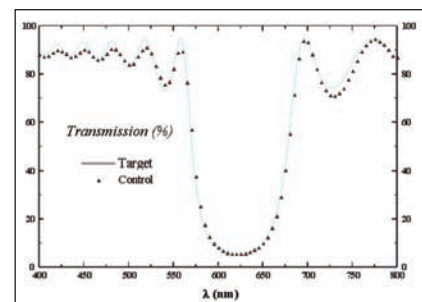


Real Time Process Control



- Thickness monitoring
- Growth and etch rates
- Endpoint detection
- Alloy composition
- Crystallinity
- Surface damage
- Contamination

Filter application



And Any Application That Needs Thin Film Characterization...



- Data storage
CD-R, CD-RW, DVD-R, DVD-RW
Magneto-optical materials (Faraday or Kerr effect)
- Non linear optical devices
- Telecommunications...



UVISEL - Bench top configuration

Flexibility Combined with High Performance

The UVISEL Spectroscopic Phase Modulated Ellipsometer is a unique instrument that delivers the highest accuracy and precision for demanding research and industrial QC applications.

It covers a wide spectral range from 190 to 2100 nm, with a complete application database included in the software.



UVISEL
Fully integrated configuration

• Ex-Situ Configuration

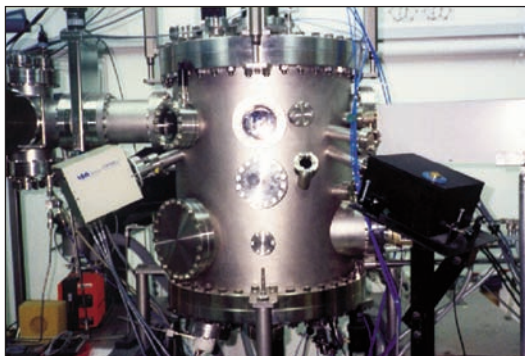
The UVISEL instrument is highly featured and integrates high stability electronic systems with advanced software capabilities.

It is possible to automate the instrument to enhance its performance and range of application by adding many available options.

When integrated into a cabinet the UVISEL addresses the needs of industrial research and process development. Its advantages are a small footprint, an easy installation and clean-room compatibility.

• In-Situ Configuration

By mounting the ellipsometer onto a process chamber the speed and stability of the in-situ UVISEL allows real-time monitoring and control of thin film deposition or etch processes with monolayer resolution.



UVISEL coupled to CVD chamber

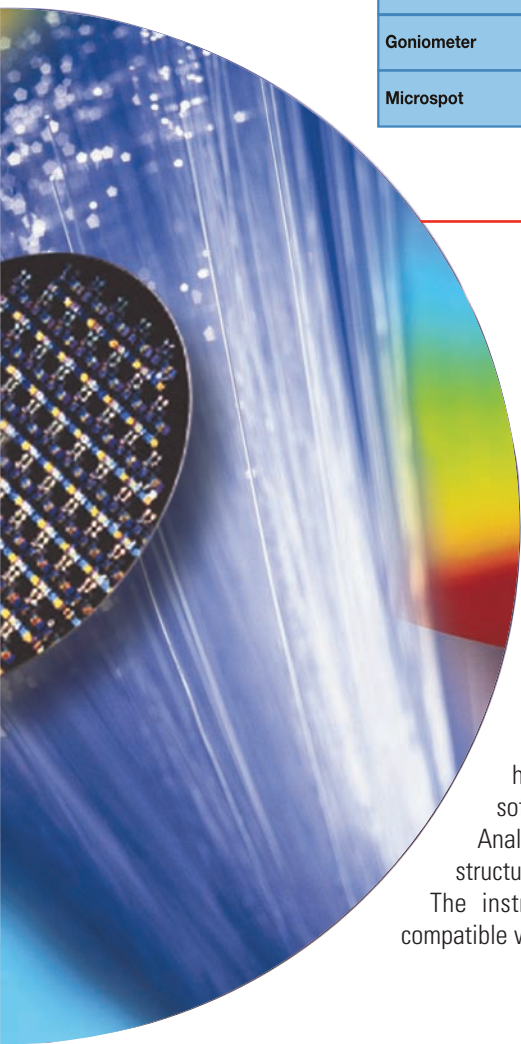
The intrinsically high acquisition rate of the UVISEL allows sampling at millisecond time resolution, making it the ideal solution for in-situ monitoring and real-time control.

The in-situ UVISEL is routinely used in plasma deposition/ etching, thermal oxidation, surface cleaning, implantation, corrosion, MBE, CVD, PVD, electrochemistry...



From
Research
to
Industry

		Uvisel	Uvisel FUV	Uvisel NIR	Uvisel ER	Uvisel MWL
Spectral Range						
Visible - 210 - 880 nm		X				X
FUV - 190 - 880 nm			X			X
NIR - 245 - 2100 nm				X		
ER - 190 - 2100 nm					X	
Configuration						
Ex-situ	Bench top	●	Typical table layout: 150 wide x 100 deep x 85 high in cm			
	Cabinet	●	Overall dimensions: 100 wide x 80 deep x 150 high in cm			
In-situ						●
Mechanical & Optical Parts						
Light Source	75 W Xe-lamp	●		●		●
	150 W Xe-lamp		●		●	●
Sample Stage	manual	●	150 mm, manual height (20 mm), tilt, theta adjustment			
	XY automatic	●	200, 300 mm, manual height (4 mm) and tilt adjustment. Options: CCD camera, Z motorized			
Goniometer	manual	●	Manually adjustable angle from 55° to 90° by step of 5°			
	automatic	●	Automatically adjustable angle from 40° to 90° by step of 0.01°			
Microspot	manual	●	3 positions: 0.08 - 0.1 - 1 mm			
	automatic	●	4 positions: 0.08 - 0.12 - 0.25 - 1.2 mm			



Thin Film Production Control

Fast, Accurate and Stable to Ensure High Yields in Quality and Quantity

The UT-300 and FF-1000 instruments have been developed to provide specific process control solutions for the semiconductor and flat panel display industries. These accurate, automated thin film metrology tools deliver both unique performance and proven reliability for on-line quality control of production processes.

Equipped with achromatic microspot optics, wafer handling system, autofocus and pattern recognition software the UT-300 - Fully Automatic Ultra Thin Film Analyzer - accurately characterizes demanding thin film structures with a throughput in excess of 100 wafers/hour. The instrument has a deep-UV option (190 nm) and is compatible with 6", 8" and 12" wafers.



UT-300

The FF-1000 features all of the advantages of the UVISEL and UT-300 with a fully automated large area sample stage able to accept samples up to 1000 mm x 1000 mm.

Two detection modes are available:

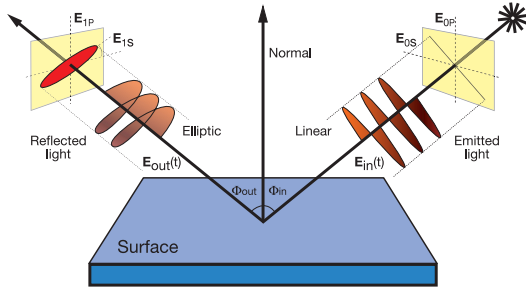
- scanning mode for highly accurate characterization of material physical properties (n, k, d, composition...)
- multiwavelength mode for fast and precise production control

Powerful software based on Windows™ allows automated measurement and analysis of single or complex multiple layer stacks.



FF-1000

Phase Modulated Ellipsometry



Unequalled Capabilities for Accurate Ultra-Thin Film Characterization

Ellipsometry is based on the measurement of the light polarization change upon reflection from a sample surface or interface. The experimental data are usually expressed as two parameters ψ and Δ , which are related to the Fresnel reflection coefficients by :

$$\rho = \frac{r_p}{r_s} = \tan\psi e^{i\Delta}$$

These two coefficients contain information related to material optical properties and physical dimensions. Spectroscopic ellipsometry measures this complex ratio ρ as a function of wavelength.

Three Key Factors for Success

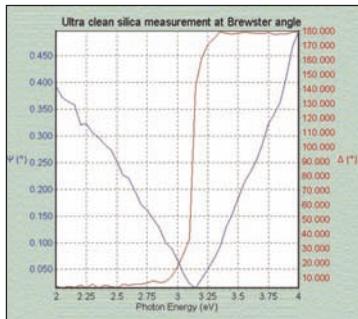
• The Most Accurate Measurement of Δ Parameter

Spectroscopic Phase Modulated Ellipsometers (SPME) use photoelastic devices to perform the polarization modulation without any mechanical movement, resulting in :

- Excellent signal/noise ratio from FUV to NIR
- No insensitive regions

This technology is consequently the best suited for accurate ultra-thin film measurement on transparent substrates.

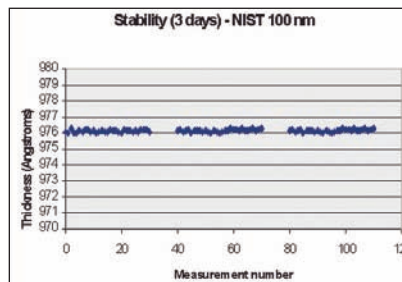
Uniqueness of Spectroscopic Phase Modulated Ellipsometry:
Accurate measurement of Δ around 0° and 180°



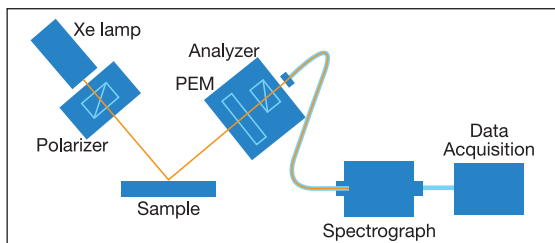
Measurement on ultra-clean silica at the Brewster angle

• High stability

State-of-the-art control of PEM allows very high system stability.



• The Highest Data Acquisition Speed

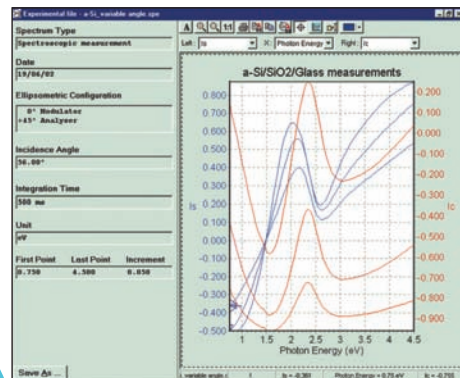
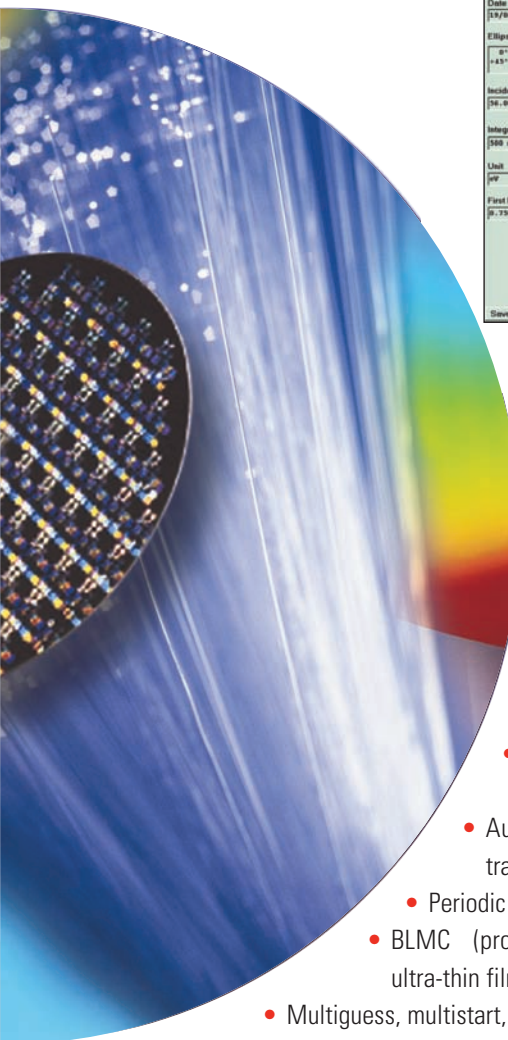


The 50 kHz modulation frequency of the Photoelastic Modulator (PEM) allows ultra fast acquisition at up to 1 ms per point for applications such as dynamic studies and liquid - surface measurements. The very high speed of the UVISL in combination with digital signal averaging provides significant advantages over conventional ellipsometers.

Commitment
to
Excellence

Advanced Spectroscopic Ellipsometry Software

Powerful DeltaPsi2 Windows™ based software makes full use of all the benefits provided by state-of-the-art HORIBA Jobin Yvon ellipsometry hardware. The largest variety of advanced modelling functions gives research engineers the full performance of ellipsometric analysis. A simple user interface allows the operator to perform routine tasks very easily.



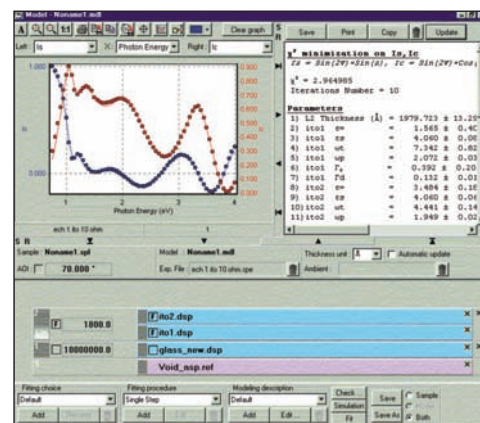
Variable angle measurements

Key Features

- Acquisition and analysis of ellipsometric, kinetic, transmission and reflection data
- Advanced mathematical fitting algorithms
- Bibliographic reference database - extendable
- Data and graphs easily transferred to Windows™ applications
- Import/export package functions for high flexibility in file manipulation

Enhanced Modelling Functions

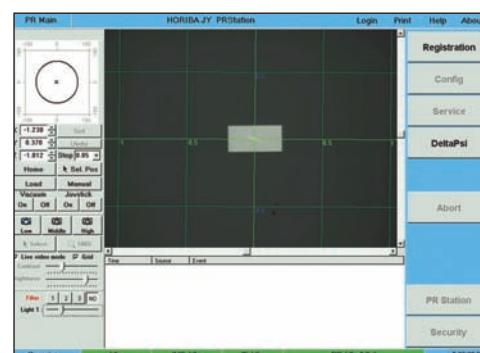
- Graded layer
- Roughness or interface
- Composition / crystallinity
- Anisotropic layer
- Thickness uniformity
- Depolarization factor
- Complete library of material properties based on dispersion relations
- Automatic backside correction for thick transparent substrates
- Periodic structure
- BLMC (proprietary mathematical algorithm) for ultra-thin film applications
- Multiguess, multistart, multimodel, correlation, ...



ITO graded layer model taking into account backside reflections

Simple Automatic Operation to Meet Production Needs

- Recipe procedure: data acquisition, analysis and mapping routines
- Fitting procedure
- Pattern recognition function
- 2D and 3D display views



Pattern recognition function



Company Profile

HORIBA Jobin Yvon have been manufacturing state-of-the-art thin film characterization instruments, spectrometers and optical components for over 185 years with results that have set spectroscopy and analytical standards worldwide. HORIBA Jobin Yvon instruments are manufactured under a strict quality assurance program to satisfy customer requirements with instrumentation of the highest level of reliability and performance.

The Thin Film Division of HORIBA Jobin Yvon offers a wide range of instruments dedicated to advanced thin film metrology, processing and plasma diagnostics for research, industrial and quality control applications. Our core technologies include Ellipsometry, Reflectometry, Optical Emission Spectroscopy (OES), and Interferometry either as single techniques or in combination for powerful customized solutions.

The HORIBA Jobin Yvon range of ellipsometers provide the highest level of performance currently available, with continuous improvement in terms of hardware performance, accessories and analysis software.

Our commitment to excellence and continued product and application support is part of the culture of HORIBA Jobin Yvon.



**Building
Successful
Relationships**



**Reliability and continued support are part of the culture of HORIBA
Jobin Yvon.**

We are committed to give you the right answer the first time.

Call us and let us work together!

Service and Application Support

A Worldwide Experienced Service Team for Your Technical Support

HORIBA Jobin Yvon offers a complete range of service and preventative maintenance plans to fit your needs and for your complete satisfaction.

Purposes of this contract are :

- System installation
- Technical training for a smooth and carefree start up
- Regular preventative maintenance actions to keep your instrument in its best working condition

Our staff of highly trained service and application engineers stand ready to provide assistance when and where you need it.

- Application training programs - advanced or basic -
- Training session seminars on site
- Sample analysis support for new applications
- Software configuration according to your applications
- Supplies, accessories and upgrades for the future growth of your instrument

Sample Measurement Service

HORIBA Jobin Yvon offers sample measurement services in its application lab.

The laboratory is equipped with ellipsometers from FUV to NIR including all options.

An expert application team will characterize your samples and provide you with a detailed analysis report.



Our extensive experience in ellipsometry applications has allowed us to compile the widest analysis database.

Feel free to contact the sales division for a quotation, in relation with our application engineers for the most appropriate technical evaluation.

Global Network

To give you easy access to our technologies and services, a global network through subsidiaries and distributors operates in more than 80 different countries as well as four application laboratories, based in France, Germany, USA and Japan, for your sample analysis.

- HORIBA Jobin Yvon Offices



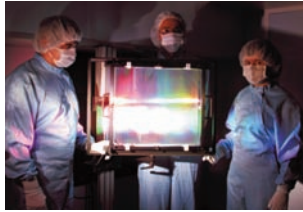
Experts in Optical Spectroscopy

www.jobinyvon.com

Raman Spectroscopy



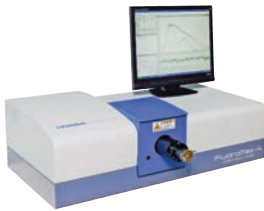
Custom Gratings and VUV Beamlines



Ellipsometry



Spectrofluorometry



OEM Spectrometers & Gratings



Thin Film Process Control



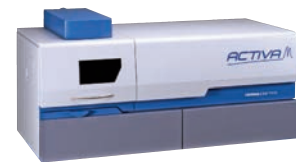
X-ray Fluorescence



Detectors



Atomic Emission Spectroscopy



Particle Size Analysers



Optical Spectroscopy



Forensics



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