Semiconductor (https://sci-soft.com/products/semiconductor/)

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Thin Film Design Software (https://sci-soft.com/products/thin-film-design-software/)

FilmTek 2000 SE

Spectroscopic Ellipsometry with 0.03 Å Repeatability on Native Oxide

The FilmTek™ 2000 SE benchtop metrology system provides unmatched measurement performance, versatility, and speed for unpatterned thin to thick film applications. It is ideally suited for academic and R&D settings.

The FilmTek™ 2000 SE combines spectroscopic ellipsometry and DUV multi-angle polarized reflectometry to simultaneously measure film thickness, refractive index, and extinction coefficient.

Our advanced rotating compensator design allows for precision and accuracy throughout the full range of delta (Δ), including near 0° and 180°. This allows for optimal performance when measurements are not possible near the Brewster condition, a feature essential for accurate measurement of very thin films on silicon or glass substrates.

Measurement is efficient and easy. Thousands of wavelengths are simultaneously collected in seconds, and the integrated auto-focus feature eliminates the tedious task of manual sample alignment required by comparable ellipsometers.

The FilmTek™ 2000 SE is a fully-integrated package, paired with intuitive material modeling software to make even the most demanding of measurement tasks simple and reliable. FilmTek™ software includes fully user-customizable sample mapping capabilities to rapidly generate 2D and 3D data maps of any measured parameter. In addition to user-defined patterns, standard map patterns include polar, X-Y, rθ, or linear.

Key Features:

- Spectroscopic ellipsometry with rotating compensator design (300nm-1700nm)
- Multi-angle, polarized spectroscopic reflection (240nm-1700nm)
- Measures film thickness and index of refraction independently
- Automated stage with autofocus
- Ideal for measuring ultra-thin films (0.03 Å repeatability on native oxide)
- Optional generalized ellipsometry (4×4 matrix generalization method) for anisotropy measurements (n_x, n_y, n_z)

Measurement Capabilities:

FilmTek™ 2000 SE incorporates SCI's generalized material model with advanced global optimization algorithms for simultaneous determination of:

- Multiple layer thicknesses
- Indices of refraction [n(λ)]
- Extinction (absorption) coefficients [k(λ)]
- Energy band gap [E_g]
- Composition (e.g., %Ge in $SiGe_x$, % Ga in $Ga_xIn_{1-x}As$, %Al in $Al_xGa_{1-x}As$, etc.)
- Surface roughness
- Constituent, void fraction
- Crystallinity/Amorphization (e.g., degree of crystallinity of Poly-Si or GeSbTe films)
- Film gradient

Applications

Virtually all translucent films ranging in thickness from 1 angstrom to approximately 150 microns can be measured with high precision. Typical applications include:

- Semiconductor and dielectric materials
- Multilayer optical coatings
- Optical antireflection coatings
- Electro-optical materials
- Computer disks
- Coated glass
- Thin metals
- Solar cells

Example Films

- SiO_x
- SiN_x
- DLC
- SOG
- a-Si
- a-C:H
- ITO
- Polysilicon

- Photoresist
- Thin metals
- Polyimide
- Low k dielectric films

Example Substrates

- Silicon
- SOI
- SOS
- GaAs
- InP
- Aluminum
- Copper
- Glass

Technical Specifications	
Film thickness range:	0Å to 150μm
Film thickness accuracy:	±1.0Å for NIST traceable standard oxide 100Å to 1μm
Spectral range:	240nm to 1700nm (240nm to 1000nm is standard)
Measurement spot size:	3mm
Sample size:	2mm to 300mm (150mm standard)
Spectral resolution:	0.3-2nm
Light source:	Regulated deuterium-halogen lamp (2,000 hrs lifetime)
Detector type:	2048 pixel Sony linear CCD array / 512 pixel cooled Hamamatsu InGaAs CCD array (NIR)
Automated Stage with Auto Focus	300mm (200mm is standard)
Computer:	Multi-core processor with Windows™ 10 Operating System
Measurement time:	~2 sec (e.g., oxide film)

Performance Specifications			
Film(s)	**Thickness**	**Measured Parameters**	**Precision (1σ)**
Oxide / Si	0-1000 Å	t	0.03 Å
	1000-500,000 Å	t	0.005%
	1000 Å	t , n	0.2 Å / 0.0001
	15,000 Å	t , n	0.5 Å / 0.0001
	150,000 Å	t , n	1.5 Å / 0.00001
Photoresist / Si	200-10,000 Å	t	0.02%
	500-10,000 Å	t , n	0.05% / 0.0002
Nitride / Si	200-10,000 Å	t	0.02%
	500-10,000 Å	t , n	0.05% / 0.0005
Polysilicon / Oxide / Si	200-10,000 Å	t_{Poly} , t_{Oxide}	0.2 Å / 0.1 Å
	500-10,000 Å	t_{Poly} , t_{Oxide}	0.2 Å / 0.0005

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