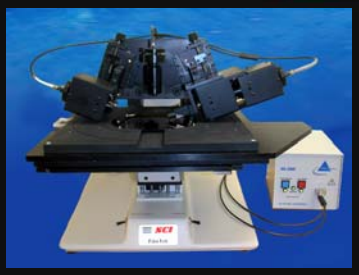
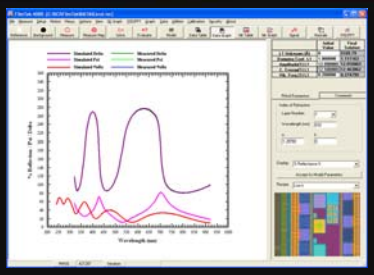
FilmTek™ 2000SE and FilmTek™ 3000SE Spectroscopic Ellipsometer

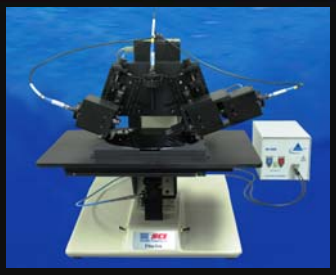
0.03 Å Repeatability on Native Oxide



FilmTek™ 2000SE



FilmTek™ Software



FilmTek™ 3000SE

FilmTek™ 3000 PAR-SE with AutoLoader

The FilmTek™ 2000SE is an affordable spectroscopic ellipsometer that measures from the deep UV to NIR (190-1700nm). Based on a rotating compensator design, the FilmTek™ 2000SE spectroscopic ellipsometer combines spectroscopic ellipsometry with normal incidence reflectometry to make it ideally suited for measuring the thickness and optical constants of very thin films. The FilmTek™ 3000SE spectroscopic ellipsometer adds transmission measurement capability in addition to spectroscopic ellipsometry and reflectometry. The FilmTek™ 2000SE spectroscopic ellipsometer utilizes SCI's material modeling software to provide an affordable and reliable tool for the simultaneous measurement of film thickness, index of refraction, and extinction coefficient.

- Spectroscopic reflection (190nm-1700nm) of polarized light at multiple angles
- Spectroscopic ellipsometry with rotating compensator design (300nm-1700nm)
- Measures film thickness and index of refraction independently
- Multi-Angle Differential Polarimetry (MADP) technology with SCI's patented Differential Power Spectral Density (DPSD) technology
- Ideal for measuring ultra-thin films (0.03 Å repeatability on native oxide)

FilmTek™ 2000SE Features

- Versatile: FilmTek™ 2000SE 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 [Eg]
  - Constituent and void fraction
  - Film gradient
- Low Cost: The cost of ownership of FilmTek™ 2000SE is very competitive with comparable instruments.
- No special knowledge required: FilmTek™ 2000SE software is designed so that minimal experience in personal computers, thin film optical design, or measurement techniques is required.
- Complete "turn key" System: A fully integrated measurement system with calibration, acquisition, and analysis software.
- Non-contact and non-destructive.
- Flexible: FilmTek™ hardware and software can be easily modified to satisfy unique customer requirements.

Optional Features

- Computer controlled automated stage
- Cassette to cassette wafer handling
- Pattern recognition (Cognex)

Technical Specifications

Film thickness range:	1Å to 150μm
Spectral range:	190 to 1700nm (240 to 1000nm standard)
Measurement spot size:	2mm to 50μm (2mm is standard)
Spectral resolution:	0.3-2nm
Data acquisition and analysis time:	~5sec

Methodology

The FilmTek™ 2000SE spectroscopic ellipsometer simultaneously solves for refractive index n(λ), extinction coefficient k(λ), and thicknesses of multi-layer film structures. A self-consistent solution is obtained by using SCI's generalized dispersion formula to model fitted values of the dielectric function ε(λ). The SCI dispersion formula is quite general and applies to metallic, amorphous, crystalline, and dielectric materials. This approach allows the user to model complex multi-layer structures with reflection/transmission or ellipsometric data. Global optimization methods are used to obtain the best solution while avoiding local minima and minimizing sensitivity to the user's initial guess of fitted parameters (e.g., layer thickness). The FilmTek™ 2000SE spectroscopic ellipsometer optimizes both the ellipsometric data and power density spectrum (FFT) simultaneously.

Applications

Virtually all translucent films ranging in thickness from 1 Å to approximately 150 μm 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**

FilmTek™ 2000SE Performance Specifications

Films	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	1000-5000 Å	t	0.02%
	1000-5000 Å	t, n	0.05% / 0.0002
Nitride / Si	1000-5000 Å	t	0.02%
	1000-5000 Å	t, n	0.05% / 0.0005
Polysilicon / Oxide / Si	850 Å / 55 Å	t Poly , t Oxide	0.2 Å / 0.1 Å
	850 Å / 55 Å	t Poly , t Oxide	0.2 Å / 0.0005