

Scientific Computing International (美国科学计算国际公司)

SCI is a world leader in providing high resolution thin-film metrology systems and analysis software products to leading companies in the semiconductor, optoelectronics, data storage, display, MEMS, and optical coating industries. SCI offers metrology systems for thin-film material characterization, with models that range from table-top systems suitable for R&D to fully automated, standalone production tools, and software products for thin-film analysis and design. SCI is a privately held company headquartered in Carlsbad, California, with a global network of sales, service, and support offices strategically located in the United Kingdom, Germany, Taiwan, Singapore, Korea, and Japan.

SCI 是薄膜高分辨率测量仪器和分析软件的世界领先者,广泛应用于半导体,光电子,数据存储,显示器,MEMS 等工业领域.

中电网 EMD(半导体设备与材料部)简介

中电网 EMD 是从属于信息产业部 CCID 的从事国际半导体制造设备与材料引进及介绍的专业代理机构;

中电网 EMD 目前已成功地代理了十二家来自美国,韩国,意大利,德国等地的先进半导体制造商的设备与材料;

代理产品:

SCI (USA)高准确性薄膜测量系统 thin-film metrology systems
网址:www.sci-soft.com

中电网 EMD (半导体设备与材料部) 网址: www.chinaemnet.com

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Company History(公司历史)

In 1993 SCI was founded to provide software products for thin-film analysis and design to the research and development community and the optical coating industry. SCI's FilmWizardTM software was introduced the same year.

In 1996, FilmWizardTM was recognized as the leading software package for thin film analysis and design.

In 1998, SCI expanded into the wafer metrology business and introduced the FilmTekTM line of thin-film metrology systems based on the reflection of broadband light.

In 1999, SCI developed and patented multi-angle differential power spectral density technology and introduced the FilmTekTM 4000, a metrology system with a resolution 100 times better than existing tools. The FilmTekTM 4000 quickly became the standard film metrology tool used in the production of integrated optical components for the optical telecommunications industry.

In 2000, the first fully automated, robotic FilmTekTM 4000 was installed. The FilmTekTM 4000 quickly became the standard film metrology tool used in the production of integrated optical components for the optical telecommunications industry.

In 2002, FilmTekTM instruments were improved with the capability of measuring down to 190 nm with small spot sizes (<50um).

In early 2003, SCI developed multi-angle differential polarimetry technology and introduced the FilmTekTM 4000EM-DUV, a metrology system which is far more sensitive to changes in very thin films, particularly films within multi-layer stacks, than existing metrology tools that rely on conventional ellipsometry or reflectometry techniques.

In July 2004, the first FilmTek 4000EM-DUV was shipped for the measurement of the most advanced 300mm Semiconductor films.

Currently SCI has an installed base of about 550 software packages and over 140 FilmTekTM instruments.

SCI continues to innovate and develop new technologies to provide the highest-resolution metrology tools available for our customers in the semiconductor, optoelectronics, data storage, display, MEMS, and optical coating industries.

SCI CUSTOMERS(SCI 客户列表):

The semiconductor industry 半导体工业: R&D for wafers sizes up to 8"

- Intel 美国英特尔公司
- ST Microelectronics 意法半导体公司
- Infineon 德国英飞凌尔公司
- Samsung semiconductor 韩国三星半导体公司

The University and R&D 大学和研究院:

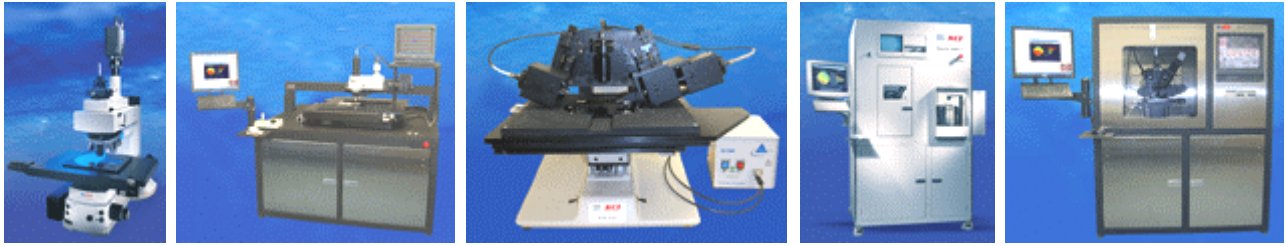
- Integrated Manufacturing Technologies Institute,Canada
- 加拿大集成制造技术学院
- Department of Chemistry,University of Oulu, Finland 芬兰奥鲁大学
- Department of Electrical and Communications Engineering,Helsinki University of Technology 芬兰赫尔辛基理工大学
- Lucent (30 台以上) 美国朗讯科技公司,
- MicroChem Corp., Newton MA

The display industry: for large panels (370mm x 470mm panels)

- ERSO in Taiwan
- Ness Display (Korean). 韩国 NESS
- Samsung (Korean) 韩国
- Symmorphix, Inc(USA) 美国
- more than 40 FilmTek systems to a major Japanese display company 日本

And so on

SCI Metrology Products(测量产品)



FilmTek™ spectrophotometry-based metrology systems from Scientific Computing International (SCI) have long set the standards for characterization of thin films. Now — our FilmTek™ 4000 Series "raises the bar" by delivering 100 times the resolution of the best non-contact method, and 10 times the resolution of the best prism coupler contact systems. It's the result of our patented DPSD™ (Differential Power Spectral Density) technique. And it's the latest example of how SCI is leading the thin film metrology field by raising performance to a new level — while offering systems that are truly affordable for virtually every application.

Widest Film Thickness, Layer & Spectral Ranges(很宽的薄膜厚度, 多层, 很宽的光谱范围)

FilmTek™ metrology systems come in a variety of configurations, and depending on the model can measure reflection, reflection and transmission, multiple angle reflection, spectroscopic ellipsometry, and polarimetry data. FilmTek™ systems provide peak performance from very-thin to very-thick films (up to 250 microns). It's achieved by high wavelength resolution detectors combined with low cone angle optical design and apertures to limit measurement spot size. Depending on the films involved, FilmTek™ systems can characterize up to fifteen layers. And they all offer a wavelength measurement range from 190 to 1700 nm using our proprietary dispersion model.

Easy-to-Use Computer Power(易使用的计算机功能)

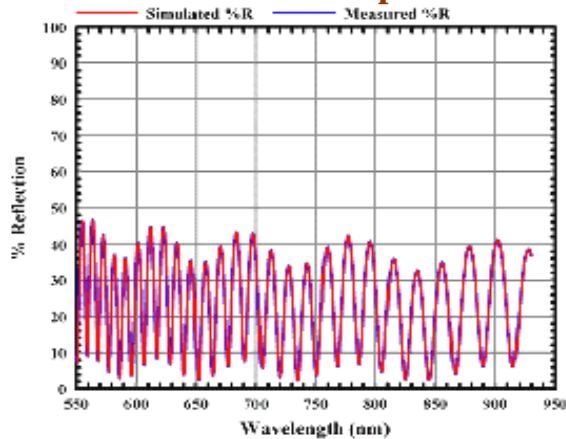
Our complete, turn-key systems are designed for simple, efficient, trouble-free push-button operation. The powerful software was designed to put measurements and answers just a click away. And to help characterize and control deposition processes, it includes such capabilities as 2D and 3D contour and surface graphic plotting, a customizable database interface, and the ability to be controlled by a host computer. Versatile, flexible, reliable standard and custom FilmTek™ systems are available in a variety of configurations — from manual table top models, to fully automated systems with robotic cassette transfer and pattern recognition. All are designed for optimum accuracy and repeatability. They're easy to calibrate and operate. And, with features like our unique optical design with no moving parts, they deliver long-lasting, reliable, trouble-free performance.

Affordable Systems for Virtually Every Budget(针对实际中每一预算的合理仪器配置)

A variety of configurations are offered in the standard FilmTek™ family. SCI also develops customized models to meet special needs. And they're all priced to fit most budgets.

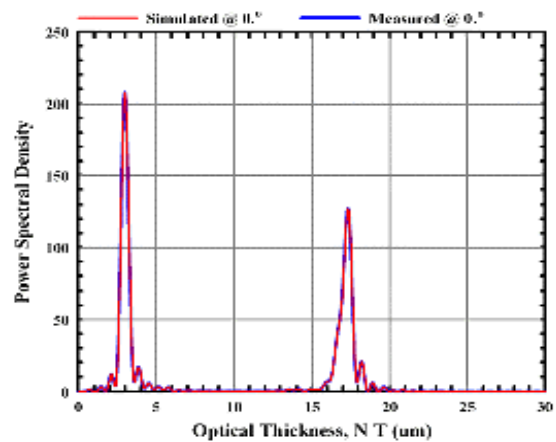
- **FilmTek™ 1000** is the most affordable system for measuring reflection at normal incidence in the visible to NIR. (反射测量可见光常规入射到近红外)
- **FilmTek™ 1500** adds transmission mode measurements to reflection. (反射测量,同时增加了透射模式测定)
- **FilmTek™ 2000** augments those capabilities to encompass surface roughness and reflection at normal incidence from deep UV to NIR. (增加了表面粗糙度测量和深紫外到近红外测量)
- **FilmTek™ 2000M-DUV** has a small measurement spot size (5 μm) and measures optical properties from 190-1700 nm. (小光点直径 5 μm 测量和光学性能测量 190-1700 nm)
- **FilmTek™ 3000 / 3000M** measures transmission and reflection of films deposited on transparent substrates. It's ideally suited for measuring the thickness and optical constants of very thin absorbing films. The FilmTek™ 3000M has a small spot size (40 μm) and can be equipped with a large custom stage for flat panel display applications. (透明衬底沉积薄膜的透射和反射测量)
- **FilmTek™ 2000SE** is an affordable spectroscopic ellipsometer that measures from the deep UV to NIR. (深紫外到近红外测量的光谱椭偏仪)
- **FilmTek™ 4000** is our most advanced model for thick-film applications. It incorporates multiple detectors positioned at different angles of incidence — plus our patented multi-angle Differential Power Spectral Density analysis capability — to accurately measure the index of refraction with a resolution of 0.00002. That's 100 times the performance of the best non-contact method, 10 times that of the best prism coupler contact systems. The FilmTek™ 4000 can measure birefringence of anisotropic materials. With its hot plate option, it can characterize the index of refraction and thermal expansion of a film as a function of temperature. And its spectroscopic ellipsometer option allows measurement of very thin films. A prime application for this system is measuring the index of refraction and thickness of planar waveguide films. (折射系数分辨率 0.00002, 双折射各向异性材料测量, 热板)
- **FilmTek™ 4000EM-DUV** is our most advanced thin-film metrology system. It leverages the combination of new proprietary Multi-Angle Differential Polarimetry technology with SCI's patented Differential Power Spectral Density technology to provide an optical thin-film metrology tool with the best resolution, accuracy, and repeatability in the industry. The FilmTek™ 4000EM-DUV utilizes spectroscopic reflection (190nm-1700nm) of polarized light at multiple angles to independently measure film thickness and index of refraction. By independently measuring index and thickness, the FilmTek™ 4000EM-DUV is far more sensitive to changes in films, particularly films within multi-layer stacks, than existing metrology tools that rely on conventional ellipsometry or reflectometry techniques. Additionally, the FilmTek™ 4000EM-DUV has a small measurement spot size to allow for measurement directly on product wafers (measures within a 50x50 micron feature). (晶片 50x50 微米测量)

Reflectance and Power Spectral Density Analysis(反射系数和功率谱密度分析)



Analysis of polyimide film coating a thermal oxide film grown on a silicon wafer.

热氧化物薄膜(生长在硅晶片上) 涂布聚酰
 亚胺薄膜的分析

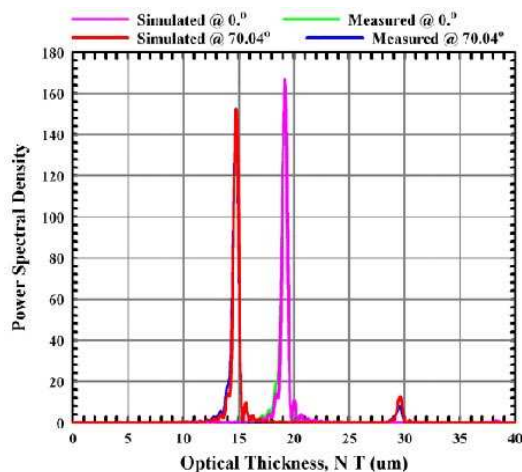


Power Spectral Density analysis of polyimide and oxide films.

聚酰亚胺和氧化物薄膜的功率谱密度分析

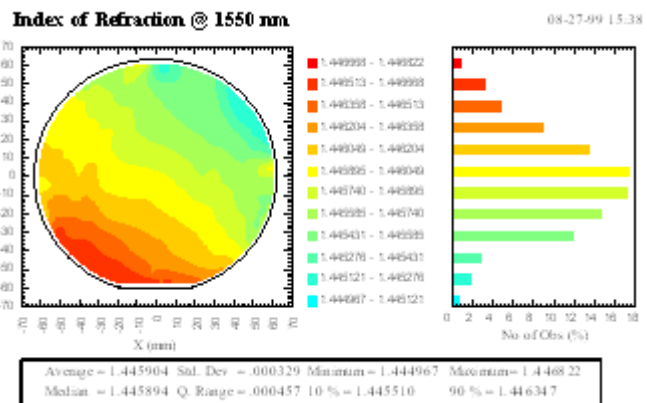
FilmTek™ 4000 High Precision Measurement of Index(高精度测量系数)

This unique FilmTek™ 4000 capability employ's our patented DPSD (Differential Power Spectral Density) technique. Spectroscopic reflection data are gathered at normal incidence and 70 degrees. PSD processing results in two peaks in the Power Spectral Density domain. The ratio of their positions is a function of the index of refraction of the film, and the angle of incidence of the oblique measurement. This ratio is used to calculate the index. Once the index is known, the thickness can be calculated from the optical thickness of the normal incident peak.



Differential Power Spectral Density analysis of an oxide film.

(氧化物薄膜微分功率谱密度分析)

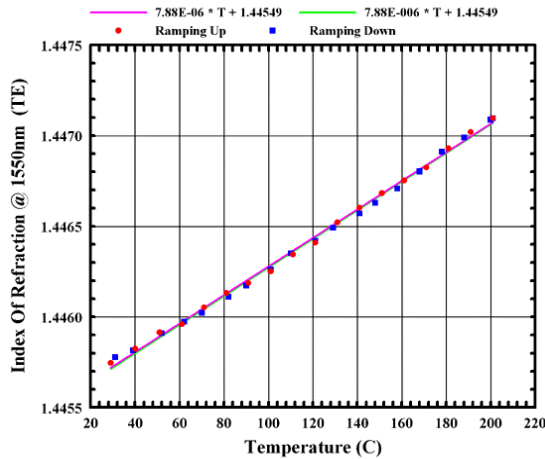


Index Map @ 1550nm of a doped oxide
 measured with FilmTek™ 4000.

(掺杂质的氧化物 1550nm 实测图)

SiO₂ Film Properties vs Temperature (SiO₂ 温度薄膜特性)

With the hot plate option, the FilmTek™ 4000 can characterize the index of refraction and thermal expansion of a film as a function of temperature.

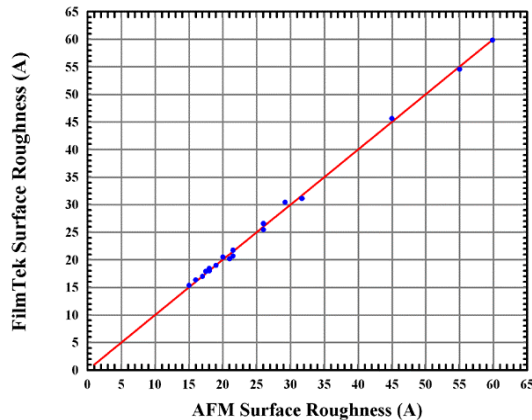


Measured by FilmTek™ 4000 with heating chuck during one heat-cool cycle.

(用加热卡盘进行热循环实测)

FilmTek™ Surface Roughness Measurement(表面粗糙度测量)

Fast, dependable, and non-contact, FilmTek™ measures surface roughness and damage with excellent correlation to other measurement techniques such as atomic force microscopy (AFM).



FilmTek™ 2000 vs AFM surface roughness measurement.

(FilmTek™ 2000-原子力测试仪表面粗糙度测量比较)

SCI Dispersion Model(散射模型)

Our dispersion model is derived from quantum mechanical principles and correctly obeys the Kramer-Kronig relationship. It is applicable to metallic, semiconductor, amorphous, crystalline, and dielectric materials. A broad array of single layer and multilayer films have been successfully analyzed, including: 可分析很多单/多层薄膜:

• SiNx 氮化硅薄膜	• DLC 类金刚石薄膜
• SiOxNx 氮氧化硅薄膜	• Low K Dielectrics 低介电薄膜
• Polysilicon 多晶硅薄膜	• High K Dielectrics 高介电薄膜
• PSG 磷硅酸盐玻璃薄膜	• Photoresist 光刻胶薄膜
• BPSG 硼磷硅酸盐玻璃薄膜	• Polyimide 聚酰亚胺薄膜
• ITO 锡铟氧化物薄膜	• SOG 玻璃上系统薄膜
• a-Si 非晶硅薄膜	• Porous Films 多孔薄膜
• a-c:H 氧化类金刚石薄膜	• Films used for manufacturing thin film heads

Substrate examples include: (衬底实例)

• Silicon 硅衬底	• GaAs 砷化镓衬底
• SOI 衬底	• Glass 玻璃衬底
• SOS 衬底	• Aluminum 铝衬底
• InP 氮化铟衬底	• Ge 锗衬底

By employing a dispersion model covering the entire wavelength range of the measurement, the number of variables or parameters required to model optical response is reduced, eliminating the potential for multiple solutions.

FilmTek™ Configurations(仪器配置)

We offer a variety of configurations and options to fit every need from R&D to high volume manufacturing in controlled environments.

They include:

- Standard probe head (<1 mm spot size) 标准探针头(光点直径<1 mm)
- Microscope based (down to 5 µm spot size) 显微镜(光点直径 down to 5 µm)
- Reflection mode measurements 反射模式测量
- Transmission mode measurements 透射模式测量
- Spectroscopic ellipsometry measurements 光谱椭圆偏光法测量
- Automated stage 自动化传送
- Cassette to cassette robotic transfer 盒到盒机器传递
- SMIF box
- Pattern recognition 模式识别
- Heating chuck 加热卡盘
- In-situ; for integration with process equipment
- Windows based operating system “Windows” 操作系统
- Menu-driven, user friendly software 易用的软件

SCI's products are offered in three categories; stand-alone FilmTek™ film metrology systems, film design and analysis software, and Integrated Metrology Modules. The latter is only offered to OEM companies on a project by project basis.

SCI FilmTek™ Systems(仪器型号及测试功能配置说明)

FilmTek™ systems are offered in a variety of configurations and capabilities in order to match every film measurement need and budget. These systems are computer controlled and offer full automation through simple to use recipe-based control software. The measurements are non-contact, and most can take place in as little as one second. The following table summarizes some of the features of the standard models. The large array of available options make it possible to tailor a FilmTek™ system according to the exact customer requirements.

Measurement Features 测量特征	FilmTek™ 1000	FilmTek™ 1500	FilmTek™ 2000	FilmTek™ 3000	FilmTek™ 2000SE	FilmTek™ 4000
Index of Refraction 折射指数 (at 2μm thickness)	±0.005	±0.005	±0.002	±0.002	±0.0002	±0.00002
Thickness Measurement Range 厚度测量范围	10nm-150mm	10nm-150mm	5nm-150mm	5nm-150mm	1Å-150mm	3nm-350mm
Maximum Spectral Range 最大光谱范围	380-1000nm	380-1000nm	190-1700nm	190-1700nm	190-1700nm	190-1700nm
Standard Spectral Range 标准光谱范围	380-1000nm	380-1000nm	240-860nm	240-860nm	240-1000nm	380-1000nm
Reflection 反射测量	✓	✓	✓	✓	✓	✓
Transmission 透射测量		✓		✓		
Optional Spectroscopic Ellipsometry 可选择的光谱椭圆偏光法测量					✓	✓
Power Spectral Density 功率谱密度测量	✓	✓	✓	✓	✓	✓
Multi-angle Measurements (DPSD) 多角度测量						✓
Both TE & TM Components of Index						✓
Multi-layer thickness 多层厚度测量	✓	✓	✓	✓	✓	✓
Index of Refraction 折射系数测量	✓	✓	✓	✓	✓	✓
Extinction (absorption) Coefficient 消光(吸收)系数	✓	✓	✓	✓	✓	✓
Energy band gap 能量带隙测量			✓	✓	✓	✓
Composition 成分测量			✓	✓	✓	✓
Crystallinity 晶状测量			✓	✓	✓	✓
Inhomogeneous Layers 非均匀层测量			✓	✓	✓	✓
Surface Roughness 表面粗糙度测量			✓	✓	✓	✓
A variety of options can extend these standard measurement capabilities.						