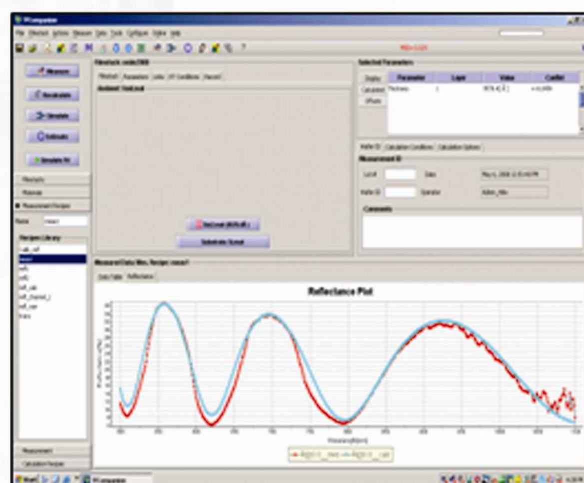
Thin Film Measurement Systems for Single and Multilayer Film Structures

StellarNet's Thin Film measurement systems measure thickness and index of both single-layer and multilayer films in less than a second (up to 5+ layers). The non-contact thickness measurement systems come complete with instrumentation and software including a large library of materials data to support multilayer, freestanding, rough, and both thick & thin layer structures. With USB connectivity and the powerful, user-friendly TFCompanion software, daily complex measurements are made quick and simple! Several configurations are available for measuring thin films with spectral response in UV-VIS, VIS-NIR and NIR wavelength ranges (details on reverse).

TF-C-UVIS-SRN measures 50A-200um

StellarNet Thin Film Systems Ideal For:

- ***Solar PV Films*** (TFPVs) including thin silicon, II-VI (primarily CdTe), CIGS, TCO stacks, and polymides.
- On-line thickness measurements of oxides, silicon nitride and many other ***semiconductor process films***.
- In-situ measurement during ***MEMS patterning processes*** used to measure thick photoresist uniformity & thickness.
- ***Hardcoat measurements*** to measure thickness of protective films in the automotive and aviation industries.
- StellarNet Systems are also typical in ***coating measurement applications***.
- Measure LCD & OLED displays, cell gaps
- The thickness of ***rough layers*** on substrates such as steel, aluminum, brass, copper, ceramics and plastics ITO & polyamide structures.



Anti-reflection coating (SiNx) is represented using Tauc-Lorentz oscillator

ThinFilmCompanion® Features:

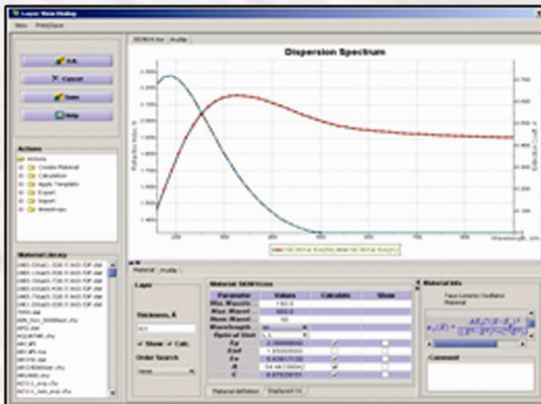
✓ Real-time Spectral Capture and Instrument control for Reflectance and/or Transmittance

✓ Includes Large Library of Materials Data

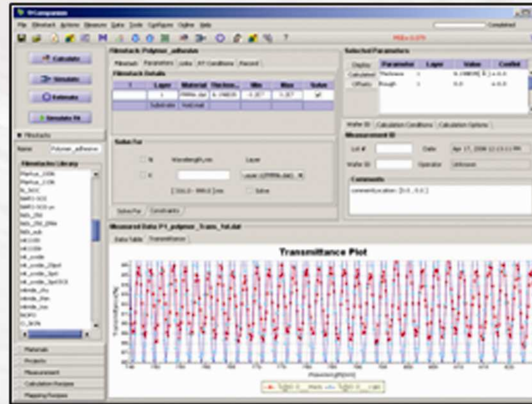
✓ Supports multilayer, freestanding, rough, and both thick and thin layer structures

✓ New materials can be easily added by measuring corresponding sample or importing data from file

✓ Supports Parameterized materials : Cauchy, Sellmeir, EMA *(effective-medium approximation)*, Harmonic oscillator, Tauc-Lorentz oscillator, Drude-Lorentz



Measured optical dispersion (n,k) of SiNx (ARC layer) represented using Tauc-Lorentz approximation.



Transmittance of a free standing polymer. Estimated thickness is ~ 81.9um

The operating software includes a large library of refractive index (n) and extinction coefficient (k) values for the most common metallic, dielectric, amorphous and crystalline substrate materials. Analyze simple and most complex filmstacks - graded layers, periodic structures, very thick films, films on thin substrates, multi-sample measurements, etc.

Measurements are made using reflectance/ transmittance spectroscopy which measures the optical response of the layer structure. The user creates an optical model of the layer structure and uses data analysis to determine physical properties and the results are inferred from the best fit of measured & modeled data.

Simulation and error-estimator tools allow user better understand data and the expected precision. During in-situ, in-line or other long running measurements, conditions including surface roughness, ambient light, etc. may be changing. TFCompanion supports roughness and scaling correction that allows factoring in these effects.

TFCompanion also supports Parameterized materials e.g. Cauchy, Sellmeir, EMA (effective-medium approximation), Harmonic oscillator, Tauc-Lorentz oscillator, Drude-Lorentz and many more approximations. These approximations represent optical dispersion of materials in desired spectral range using few coefficients that can be adjusted. For example, oxides are frequently represented using New materials can be added easily by measuring corresponding sample or importing data from the text file.

MODBUS TCP Server Add-on

The Modbus server plugin provides a communication interface over TCP IP. TFCompanion is deployed as a server and supports external program integration. This allows user to send a measurement request from any program and receive back the thickness results data.

StellarNet Thin Film Systems spot size: 1-4mm, Precision (1σ): 1A, >1000nm 2A

System	Range	Resolution	Thickness	Lamp type
TF-VIS	400-1000nm	<2nm	150A-20um	Halogen SL1
TF-C-UVIS	190-850nm	<2nm	50A-20um	Deuterium SL3
TF-C-UVIS-SR	220-1100nm	<2.5nm	50A-20um	SL1-F+ SL3
TF-NIR	900-1700nm	<5nm	1000A-200um	Halogen SL1
TF-VIS-NIR	400-1700nm	<2nm, 5>1000	150A-200um	Halogen SL1
TF-C-UVIS-SRN	200-1700nm	<2nm, 5>1000	50A-200um	Hal+Deut SL4

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