

FR-pRo: Build2Order film characterization tool

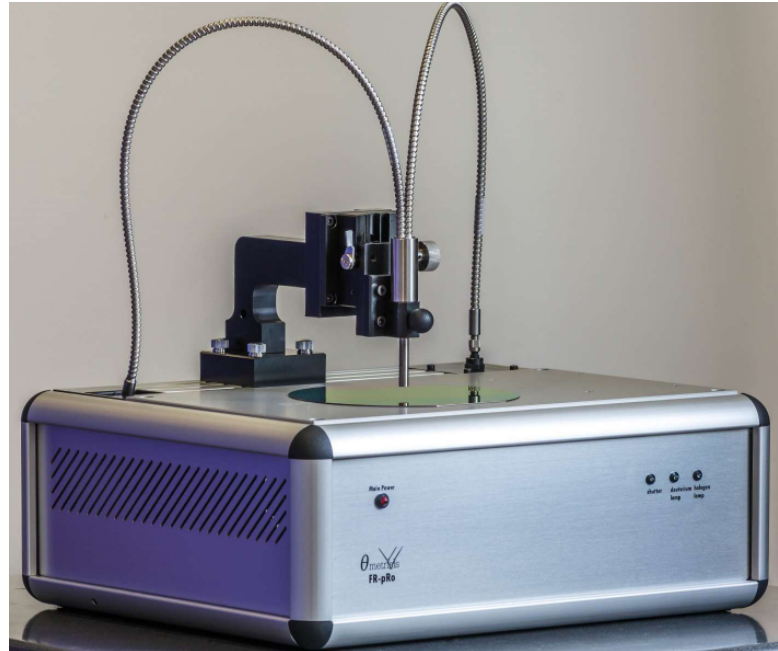
FR-pRo is a modular & expandable platform for the characterization of coatings in the **1nm-3mm** thickness range.

FR-pRo tools are tailored to the user needs for a wide range of diverse applications, such as: Film thickness, Refractive Index, Color, Transmittance, Reflectance, Film Characterization under temperature or ambient controlled environment or in liquid environment and many more ...

Applications

- **Univ. & Research labs**
- **Semiconductors**
- **Polymer & Resist characterization**
- **Chemical measurements**
- **Dielectric characterizations**
- **Biomedical**
- **Hardcoats, Anodization, Metal parts process**
- **Optical Coating**
- **non-metal Films**
- **And many more...**

(Contact us with your requirements)



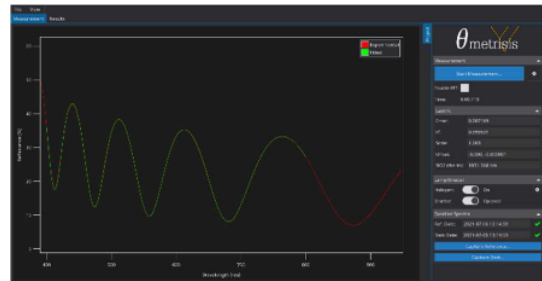
The **FR-pRo** tool is assembled by user selected modules. The Core Unit accommodates the light source, the spectrometer (for any spectral regime in the 190nm-2500nm range) and the control & communication electronics. Then, there is a wide range of Accessories, such as:

- **Film Thickness kit** for characterization of coatings,
- **FR-Mic** for measurements at very small areas,
- **Manual & Motorized stages,**
- **Film/Cuvette Holder** for Absorbance / Transmittance and chemical concentration measurements,
- **Thermal or Liquid kits** for measurements under controlled Temperature or in Liquid environment,
- **Integration Spheres** for diffuse & total reflectance

By the combination of different modules, the final set-up meets any end-user needs

Features

- Single-click analysis (no need for initial guess)
- Dynamic measurements
- Measurement of n & k, color
- Save images & videos for presentations
- Multiple installations for off-line analysis
- Free of-charge Software update



FR-pRo Specifications (standard configurations)

Model	UV/Vis	UV/NIR -EXT	UV/NIR-HR	D UV/NIR	VIS/NIR	D Vis/NIR	NIR	NIR-N1	NIR-N2	NIR-N3	NIR-N4	
WL Range -nm	200 – 850	200 –1020	200-1100	200 – 1700	370 –1020	370 – 1700	900 – 1700	850-1050	900 - 1050	1280-1350	1520-1580	
Pixels	3648	3648	3648	3648 & 512	3648	3648 & 512	512	3648	3648	512	512	
Min Thick -SiO₂	1nm	1nm	1nm	1nm	12nm	12nm	50nm	1um	4um	12um	20um	
Max Thick SiO₂	80um	90um	120um	250um	100um	250um	250um	500um	1.2mm	2mm	3mm	
Max Thick -Si								300um	500um	1mm	1.3mm	
n&k - MinThick	50nm	50nm	50nm	50nm	100nm	100nm	500nm	-	-	-	-	
Thick. Accuracy **	1nm / 0.2%	1nm / 0.2%	1nm / 0.2%	1nm / 0.2%	1nm / 0.2%	2nm / 0.2%	3nm / 0.4%	50nm / 0.2%	50nm / 0.2%	50nm / 0.2%	50nm / 0.2%	
Thick. Precision**	0.05nm	0.05nm	0.05nm	0.05nm	0.05nm	0.05nm	0.1nm		5nm	5nm	5nm	
Thick. stability**	0.05nm	0.05nm	0.05nm	0.05nm	0.05nm	0.05nm	0.15nm		5nm	5nm	5nm	
Light Source	Internal Balanced Deuterium & Halogen, 2000h					Halogen (internal), 3000h (MTBF)				SLED, 200000h (MTBF)		
Integration Time	5msec (min)					20msec (min)				20msec (min)		
Spot size	Diameter of 350um (smaller spot size options are available upon request)											
Material Database	> 700 different materials											

Accessories

- Computer
- Focusing module
- Film/Cuvette kit
- Contact probe
- Microscope
- Scanner (motorized)
- Integrating sphere
- Manual X-Y stage
- Thermal Module
- And many more.....

Laptop / Touch Panel PC with 19inch screen

Optical module attached on the reflection probe for <100um diameter spot size

Transmission measurements of films or liquids in standard cuvettes

Thickness & optical measurements of coatings in the field. Ideal for curved surfaces

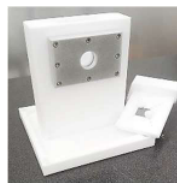
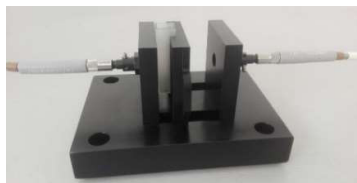
Microscope-based reflectance and thickness measurements with high lateral resolution

Polar (R-Θ) or Cartesian (X-Y) automated stage with wafer chuck. Reflectance& transmittance

For the characterization of specular and diffuse reflectance of coatings and surfaces

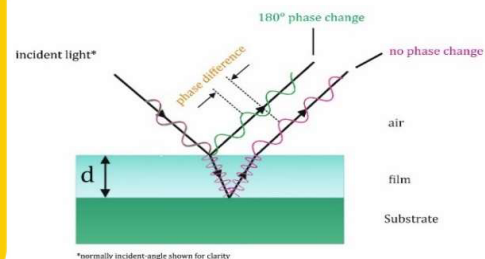
Manual X-Y stage for measurements over an area of 100mm x 100mm or 200mm x 200mm

Computer controlled Hot plate embedded in the FR-tool (Room temperature - 200°C, 0.1°C acc.)



Principle of Operation

White Light Reflectance Spectroscopy (WLRS) measures the amount of light reflected from a film or a multilayer stack over a spectral range, with the incident light normal (perpendicular) to the sample surface. The measured reflectance spectrum, produced by interference from the individual interfaces is being used to determine the thickness, optical constants (n & k), etc. of free-standing and supported (on transparent or partially/fully reflective substrates) stack of films.



* Specifications are subject to change without any notice; ** Thickness range depends on the spectral range and refers to a single layer with refractive index ~1.5 over Si or similar substrate ** Measurements compared with a calibrated spectroscopic ellipsometer and XRD, Average of standard deviation of mean value over 15 days. Sample: 1micron SiO₂ on Si wafer, Standard deviation of 100 thickness measurements. Sample: 1micron SiO₂ on Si wafer, 2*Standard-Deviation of daily average over 15 days. Sample: 1micron SiO₂ on Si wafer.