

FR-pOrtable: Accurate & USB-powered Film Characterization for Point-of-Need applications

FR-pOrtable is a unique miniaturized solution for accurate & precise non-destructive characterization of transparent and semi-transparent single films or stack of films. With FR-pOrtable the user can perform reflectance and transmittance measurements for films in the 370-1020nm spectral range.

Features

- Thickness measurement range: 12nm to 90 μ m
- Refractive Index (n & k) calculation
- Accuracy: 0.2% or 1nm
- Broad Spectral Range: 370nm – 1020nm
- USB powered
- Portable
- Reflectance, Transmittance, Absorption and Color parameters can be measured



The compact design of FR-pOrtable and the custom designed reflection probe, guarantee high accuracy and repeatability of the performed measurements. FR-pOrtable, can be either mounted on the supplied stage or can be easily transformed to a handheld thickness measurement tool to be placed over the sample under characterization. This way, FR-pOrtable is the only optical characterization tool for in-field applications.

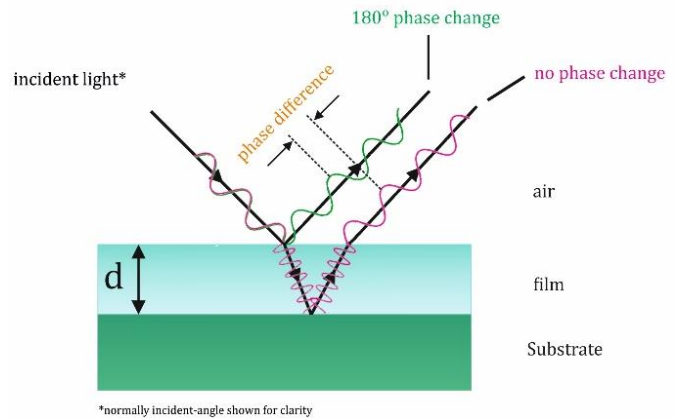


Typical Apps

- Polymer & Photoresist characterization
- Dielectric characterizations
- Semiconductors
- Optical Coating
- Non-metal Films
- Hardcoats
- Dynamic measurements
- Measurements in-the-field

Measuring Principle

White Light Reflectance Spectroscopy (WLRS) methodology measures the amount of light reflected from a thin film or a multilayer stack over a range of wavelengths, with the incident light normal (perpendicular) to the sample surface. The measured reflectance spectrum, produced by interference from the interfaces is being used to determine the thickness, optical constants, etc. of the thin film.



Specifications

Thickness measurement range	12nm – 90 μ m ¹
Refractive Index calculation	✓
Thickness measurement Accuracy ²	0.2% or 1nm
Thickness measurement Precision ³	0.05nm or 1‰ (0.01nm ⁴)
Thickness measurement stability ⁵	0.06nm
Sample size	1mm to 300mm and up
Spectral Range	370nm – 1020nm
Working distance	3mm-20mm
Spot size	1.5mm
Light Source Lifetime	20000h
Wavelength resolution	0.8nm
Number of Layers Measured	Max. 5 layers
Measurement time	10ms
A/D converter	16 bit
Power	USB - supplied
Dimensions	300mm x 110mm x 40mm ^{**}

*Specifications are subject to change without any notice

**Without the stage

¹ In certain materials the minimum thickness that can be measured is below 10nm (e.g. for Si₃N₄ is 6nm)

² Measurements compared with a calibrated spectroscopic ellipsometer and XRD

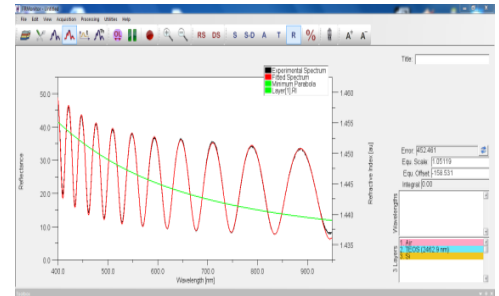
³ Average of standard deviation of mean value over 15 days. Sample: 1micron SiO₂ on Si wafer

⁴ In certain materials

⁵ 2*Standard-Deviation of daily average over 15 days. Sample: 1micron SiO₂ on Si wafer

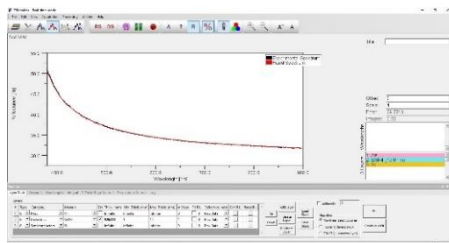
Software

FR-pOrtable is controlled by **FR-Monitor®** software, which includes the **White Light Reflectance Spectroscopy (WLRs)** model (ThetaMetrisis™) for accurate calculation of **film thickness & optical constants (n & k)** of free-standing and supported (on transparent or partially/fully reflective substrates) stack of films.

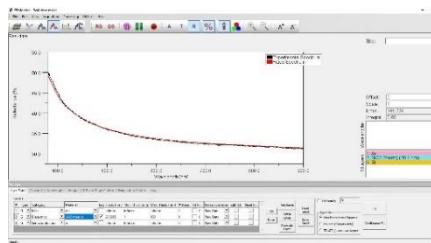


- Single-click analysis (no need for initial guess of film thickness)
- Dynamic measurements
- Save videos for presentations
- 350+ non-identical materials
- Software upgrade every six months (free of-charge for the first 3-years)
- Running on Windows XP/Vista/7/8/10 32 or 64bit

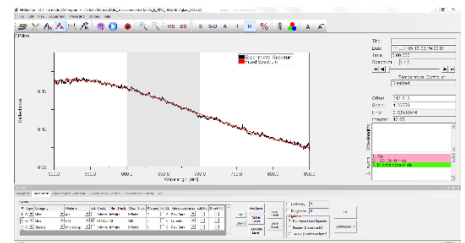
Typical Measurements with FR-pOrtable



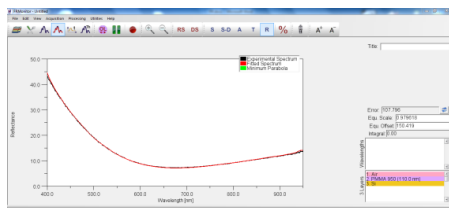
10nm Si₃N₄ layer on Si wafer



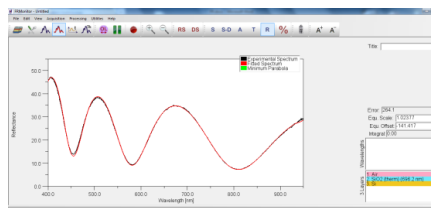
20.1nm SiO₂ layer on Si wafer



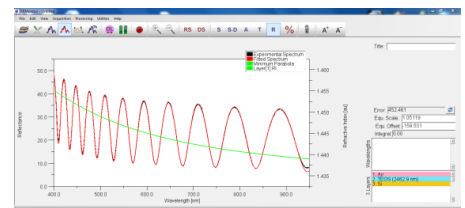
84nm TiO₂ layer on microscope glass



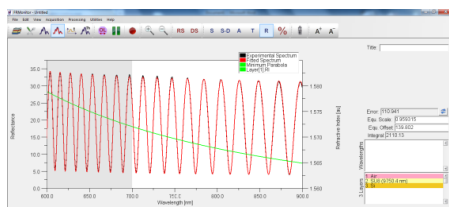
110nm PMMA layer on Si wafer



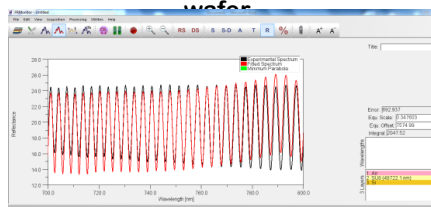
696.2nm Thermal SiO₂ layer on Si wafer



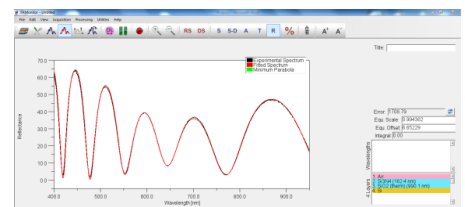
2462.9nm TEOS on Si wafer (RI calc)



9.75µm SU-8 on Si wafer (RI calc)



48.7µm SU-8 resist film on Si wafer



Sample: Si₃N₄/SiO₂ on Si wafer
Results: 162.4nm / 990.1nm

Accessories

At-the-Field adaptor: For measurements at the Point-of-Need.

Transmittance module: For the measurement of transmittance & absorbance of coatings, coating thickness etc.

Manual X-Y stage: For the characterization of coatings on multiple positions (manual movement)