ThetaMetrisis

Catalog

ThetaMetrisis – 2023.1
January 2023

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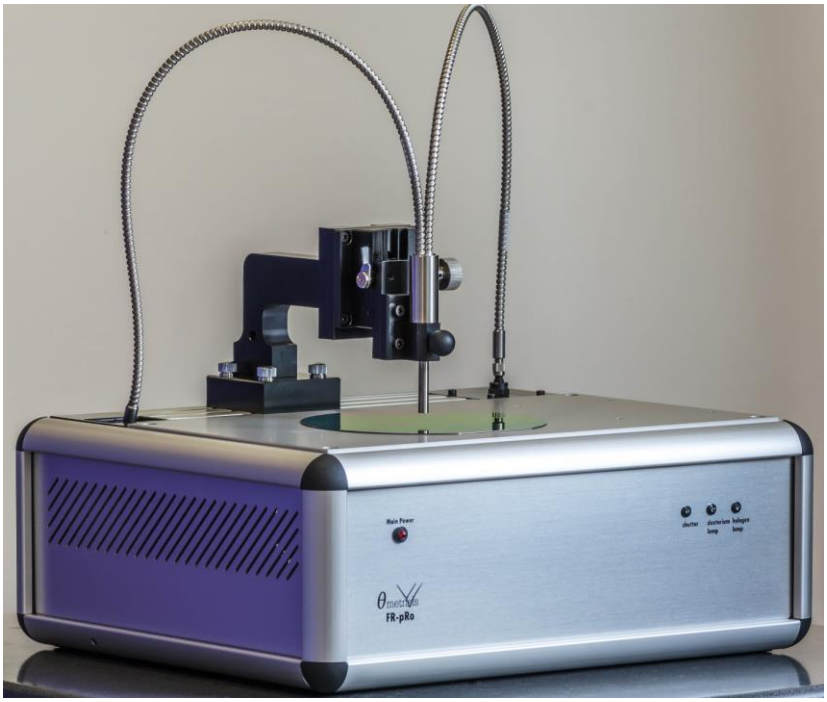
FR-pRo: Build2Order film characterization tool

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)



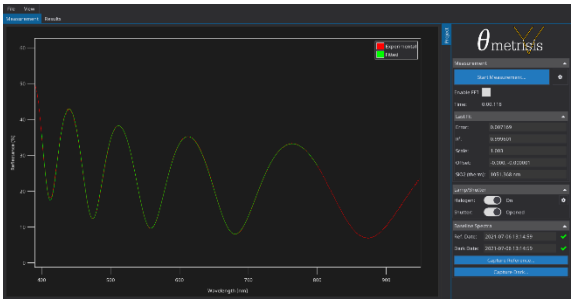
The **FR-pRo** tool is assembled by user selected modules. The Core Unit accommodates the light source, the spectrometer (for any spectral regime in the 190nm-2500nm range) and the control & communication electronics. Then, there is a wide range of Accessories, such as:

- **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

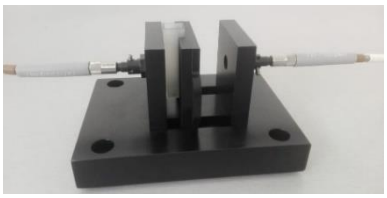


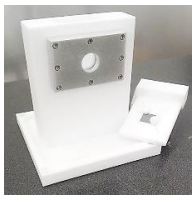
FR-pRo Specifications (standard configurations)

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 -SiO_2	1nm	1nm	1nm	1nm	12nm	12nm	50nm	1um	4um	12um	20um
Max Thick SiO_2	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
API support	YES	YES	YES	-	YES	-	-	YES	YES	YES	YES
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

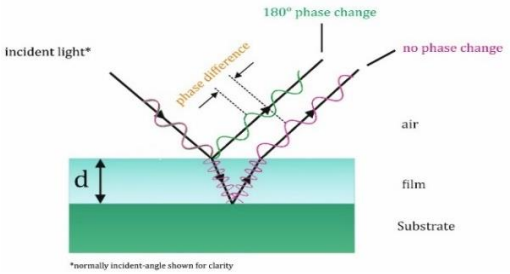
Focusing module	Optical module attached on the reflection probe for <100μm diameter spot size
Film/Cuvette kit	Transmission measurements of films or liquids in standard cuvettes
Contact probe	Thickness & optical measurements of coatings in the field. Ideal for curved surfaces
Microscope	Microscope-based reflectance and thickness measurements with high lateral resolution
Scanner (motorized)	Polar (R-Θ) or Cartesian (X-Y) automated stage with wafer chuck. Reflectance& transmittance
Integrating sphere	For the characterization of specular and diffuse reflectance of coatings and surfaces
Manual X-Y stage	Manual X-Y stage for measurements over an area of 100mm x 100mm or 200mm x 200mm
Thermal Module	Computer controlled Hot plate embedded in the FR-tool (Room temperature - 200°C, 0.1°C acc.)
And many more.....	





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.



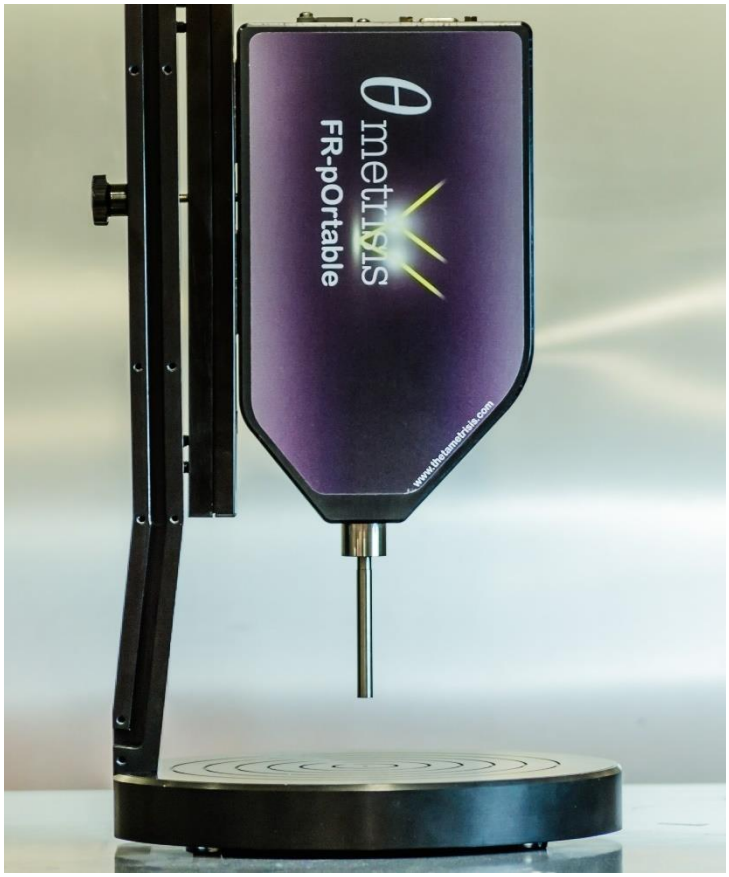
* Specifications are subject to change without any notice; ** Thickness range depends on the spectral range and refers to a single layer with refractive index ~1.5 over Si or similar substrate ** Measurements compared with a calibrated spectroscopic ellipsometer and XRD, Average of standard deviation of mean value over 15 days. Sample: 1micron SiO_2 on Si wafer, Standard deviation of 100 thickness measurements. Sample: 1micron SiO_2 on Si wafer, 2*Standard-Deviation of daily average over 15 days. Sample: 1micron SiO_2 on Si wafer.

FR-pOrtable: USB-powered, film characterization tool at the Point-of-Need

FR-pOrtable is a unique handy solution for accurate & precise non-destructive characterization of transparent and semi-transparent single films or stack of films. It is powered through the same USB port used for data transfer and can be easily used at the field (the tool comes over the sample). With **FR-pOrtable** the user can perform reflectance and transmittance measurements in the 380-1050nm spectral range.

Applications

- **Univ. & Research labs**
- **Semiconductors** (Oxides, Nitrides, Si, Resists, etc.)
- **MEMS devices** (Photoresists, Si membranes, etc.)
- **LED**
- **Data Storage**
- **Hard/Soft coatings on curved substrates**
- **Polymer coatings,** adhesives, etc.
- **Biomedical** (parylene, balloon wall thickness, etc.)
- **And more**... (Contact us with your requirements)



The compact size of **FR-pOrtable** along with the custom designed reflection probe, and the long lifetime (20.000h) broad-band light source guarantee highly accurate and repeatable measurements.

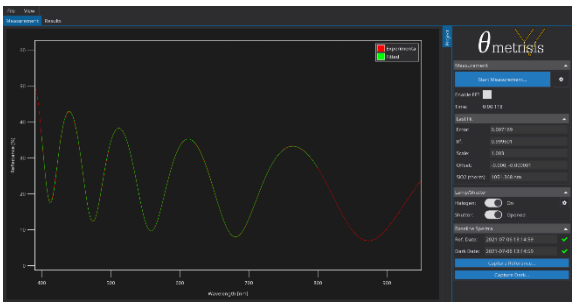
FR-pOrtable, can be either mounted on the supplied base/stage or can be easily transformed to a handheld thickness measurement tool to be placed over the sample under characterization.

FR-pOrtable is the robust & accurate thickness gauge for real-time characterization of coatings in industrial environment (e.g. R2R, belt conveyor...).

FR-pOrtable is the only USB-powered optical characterization tool for in-field applications.

Features

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



Specifications*

Thickness range	12nm – 90μm
Refractive Index calculation	✓ (100nm min. thickness)
Thickness Accuracy[1]	0.2% or 1nm
Thickness Precision[2,3]	0.02nm
Thickness stability[4]	0.05nm
Sample size	1mm to 180mm and up
Spectral Range	380nm – 1050nm
Working distance	3mm-20mm
Spot size	360um (diameter)
Light Source	Hybrid (LEDs and incandescence lamp) 20000h
Wavelength resolution	0.8nm
Number of Layers Measured	Max. 5 layers
Measurement time	10ms
A/D converter	16 bit
API support	YES
Power	USB – supplied
Dimensions	300mm x 110mm x 40mm[5]

Accessories

At-the-Field adaptor: For measurements at the Point-of-Need.
Transmittance module: For the measurement of transmittance & absorbance spectra of coatings, coating thickness etc.
Manual X-Y stage: For the characterization of coatings at multiple positions (manual movement)

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.
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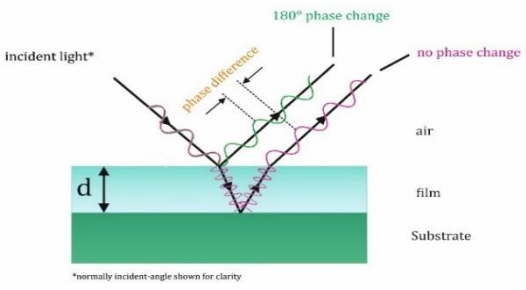

*Specifications are subject to change without any notice, [1]Measurements compared with a calibrated spectroscopic ellipsometer and XRD, [2]Average of standard deviation of mean value over 15 days. Sample: 1micron SiO_2 on Si wafer, [3]Standard deviation of 100 thickness measurements. Sample: 1micron SiO_2 on Si wafer, [4]2*Standard-Deviation of daily average over 15 days. Sample: 1micron SiO_2 on Si wafer, [5]Without the stage

FR-ES: Compact entry level system for film characterization

FR-ES a compact and light-weighted unit for the characterization of coatings. With FR-ES the user can perform reflectance and transmittance measurements in the 370-1020nm spectral range.

FR-ES platform is designed to provide an excellent performance in terms of characterization of coatings. It can be employed in a wide range of diverse applications, such as: Film thickness, Refractive Index, Color, Transmittance, Reflectance, and many more.

There are three configurations available:
VIS/NIR (370-1020nm,
NIR-N1 (850-1050nm),
NIR (900-1700nm).

Then, there is a wide range of Accessories, such as:
- **Filters** to block light at certain spectral regimes
- **FR-Mic** for measurements at very small areas,
- **Manual stage**, 25x25mm, 100x100mm or 200x200mm
- **Film/Cuvette Holder** for Absorbance / Transmittance and chemical concentration measurements,
- **Integration Spheres** for diffuse & total reflectance

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

Applications

- **Univ. & Research labs**
- **Semiconductors**
- **Polymer & Resist characterization**
- **Chemical measurements**
- **Dielectric characterizations**
- **Biomedical**
- **Hardcoat, Anodization, Metal parts process**
- **Optical Coating**
- **non-metal Films**
- **And many more...** (contact us with your requirements)

Features

- Single-click analysis (no need for initial guess)
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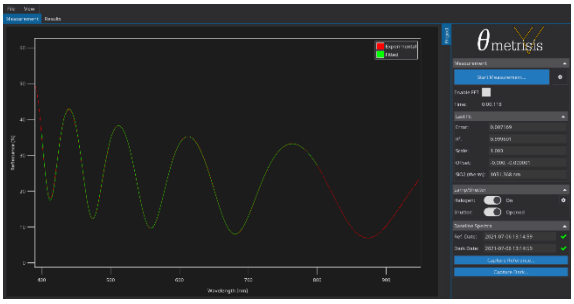
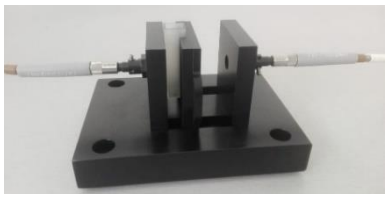


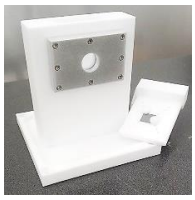
FR-ES Specifications (standard configurations)

Model	VIS/NIR	NIR	NIR-N1
WL Range -nm	370 –1020	900 – 1700	850-1050
Pixels	3648	512	3648
Min Thick -SiO_2	12nm	50nm	1um
Max Thick SiO_2	100um	250um	500um
Max Thick -Si			300um
n&k -Min. Thickness	100nm	500nm	
Thick. Accuracy *,**	1nm / 0.2%	3nm / 0.4%	50nm / 0.2%
Thick. Precision**	0.05nm	0.1nm	
Thick. stability**	0.05nm	0.15nm	
API support	YES	-	YES
Light Source	Halogen (internal), 3000h (MTBF)		
Integration Time	5msec (min)		
Spot size	Diameter of 350um (smaller spot size as option)		
Material Database	> 700 different materials		
Dimensions/Weight	20x22x6cm (LxWxH), 1.8Kg (stage excluded)		
Power	110V/230V, 50-60Hz, 10W		

Accessories

Focusing module	Optical module attached on the reflection probe for <100μm diameter spot size
Transmittance module	Optical module for transmittance/absorbance measurements
Film/Cuvette kit	Transmission measurements of films or liquids in standard cuvettes
Contact probe	Thickness & optical measurements of coatings in the field. Ideal for curved surfaces
Microscope	Microscope-based reflectance and thickness measurements with high lateral resolution
Manual X-Y stage	Manual X-Y stage for measurements over an area of 25x25mm or 100x100mm or 200x200mm





Principle of Operation

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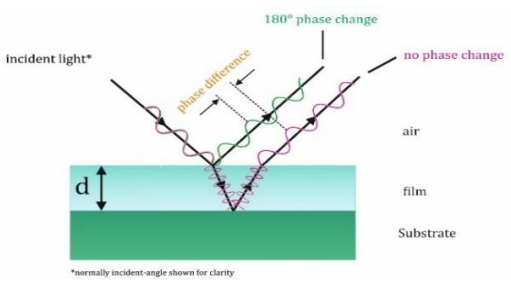

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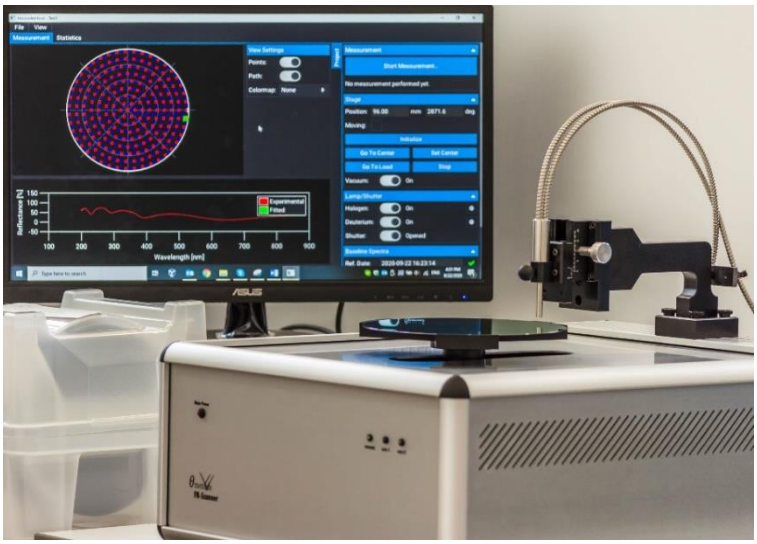
FR-Scanner AIO: Modular unit for automated, Ultra-fast & Accurate wafer mapping

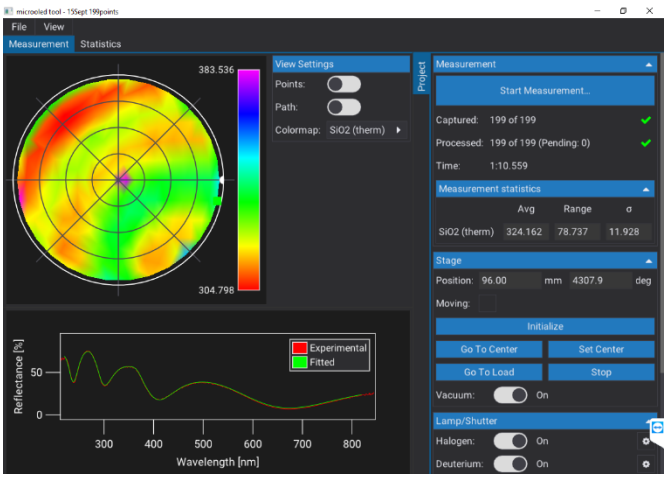
FR-Scanner AllInOne offers automatic characterization of films and coatings on wafers, masks or other substrates.
FR-Scanner is the ideal tool for the fast and accurate mapping of film properties: thickness, refractive index, uniformity, color etc.
Wafers of any diameter (300mm max) and shape can be accommodated on the vacuum chuck.

Applications

- **Semiconductor Manufacturing** (photoresists, dielectrics, poly- Si, a-Si, DLC, photonic multilayer structures)
- **PV Industry**
- **Univ. & Research labs**
- **Liquid Crystal Display**
- **Optical Coatings**
- **Polymers**
- **MEMS and MOEMS**
- **Substrates: transparent** (glass, quartz, etc.) **and semi-transparent**

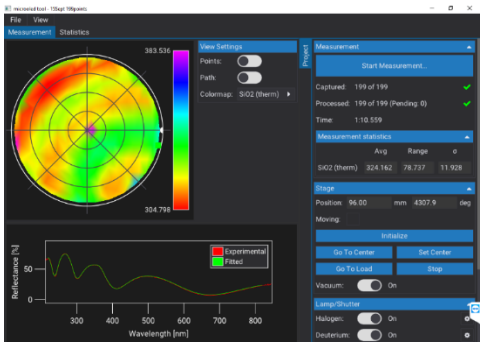


FR-Scanner scans the wafers by rotating the wafer and by moving it linearly (Polar Coordinates) with unparalleled speed and accuracy in both radius and angle. This way, accurate reflectance data with high repeatability are recorded, making FR-Scanner the ideal tool for at-line and on-line characterization of coatings on wafers or other substrates at processing facilities.
It is offered in a wide range of configurations for the characterization of films as thin as few nanometers and thick as several hundreds of microns and is accompanied with a dedicated S/W for daily routine use. FR-Scanner provides excellent performance in terms of accuracy, precision, reproducibility and long-term stability.



Features

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

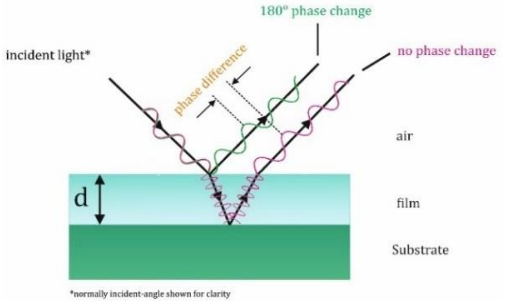


Specifications*

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 -SiO_2	3nm	3nm	3nm	3nm	15nm	15nm	50nm	1um	4um	12um	20um
Max Thick SiO_2	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)	
Wafer size	Wafers: 2in-3in-4in-6in-8in-300mm***										
Scanning Speed	200meas/min (8'' wafer size)										
Spot size	Diameter of 350um (smaller spot size options are available upon request)										
Material Database	> 700 different materials										
R/Angle resolution	5 μ m/0.1°										
Dimensions -mm	600W x 750L x 500H & 450W x 320L x 250H										
Power	110V/230V, 50-60Hz, 300W										

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.



[1] Specifications are subject to change without any notice. True X-Y scanning is also possible through custom-made configuration ** Measurements compared with a calibrated spectroscopic ellipsometer and XRD, Average of standard deviation of mean value over 15 days. Sample: 1micron SiO_2 on Si wafer, Standard deviation of 100 thickness measurements. Sample: 1micron SiO_2 on Si wafer, 2*Standard-Deviation of daily average over 15 days. Sample: 1micron SiO_2 on Si wafer. ***Stage for 450mm wafers is also available upon request.

FR-uProbe: Extend your microscope in a powerful film thickness measurement tool

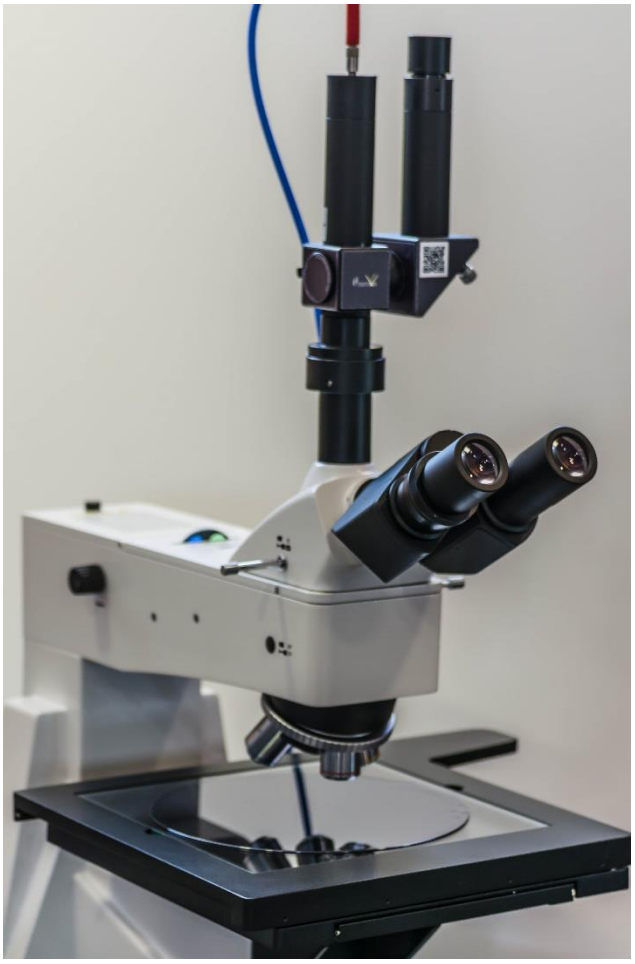
FR-uProbe is a stand-alone tool for applications that require spot size as small as very few microns, e.g. micro-patterned surfaces, samples that exhibit a high level of scattering light and numerous others.

With **FR-uProbe**, local film thickness, optical constants, reflectance, transmission, and absorbance measurements in Vis/NIR, is just a matter of a click.

Applications

- **Univ. & Research labs**
- **Semiconductors** (Oxides, Nitrides, Si, Resists, etc.)
- **MEMS devices** (Photoresists, Si membranes, etc.)
- **LED**
- **Data Storage**
- **Anodization**
- **Hard/Soft coatings on curved substrates**
- **Polymer coatings,** adhesives, etc.
- **Biomedical** (parylene, balloon wall thickness, etc.)

And many more…

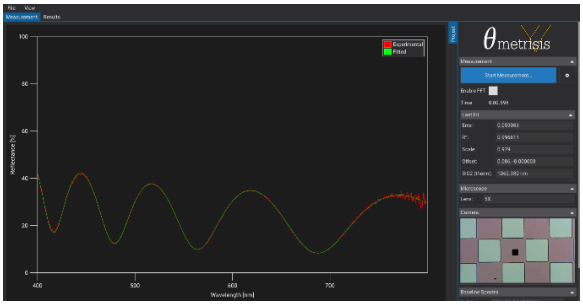


FR-uProbe, simply attaches to the C-mount adapter of most commercially available optical microscopes (reflectance and / or transmittance) and provides:

- Real-time spectroscopic measurements at the wavelength range supported by the microscope
- Film thickness, optical properties, non-uniformity measurements
- Imaging with an integrated, USB connected and high-resolution & quality color camera
- Unaffected performance of the microscope itself

Features

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



Specifications

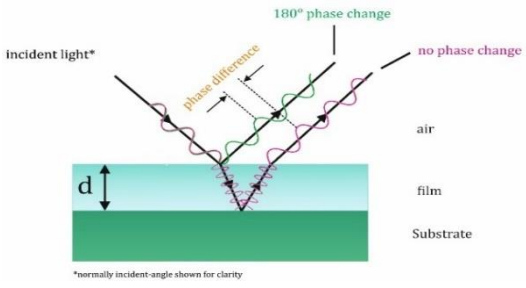
Microscope	Reflectance/Transmittance trinocular
Spectral Range	400nm – 1000nm
Thickness range (5X obj. lens)	15nm – 90μm
Thickness range (10X obj. lens)	15nm – 80μm
Thickness range (20X obj. lens)	15nm – 40μm
Thickness range (40X obj. lens)	15nm – 10μm
Refractive Index calculation	✓ /min. thickness: 100nm
Thickness Accuracy[1]	0.2% or 2nm
Thickness Precision[2,3]	0.02nm
Thickness stability[4]	0.05nm
Camera	2 or 5Mpixel high resolution
Working distance	Defined by objective lens
Light source	Microscope's light source (tungsten / LED)
Wavelength resolution	0.8nm
Number of Layers Measured	Max. 5 layers
A/D converter	16 bit
FR-API	YES
Power	USB – supplied
Dimensions	300mm x 110mm x 40mm[5]

The measurement area (the area from which the reflectance or transmittance signal is collected) is relative to the microscope's objective lens and the FR-uProbe's aperture size

Objective Lens	**Spot Size (μm)**		
	500 μm Aperture	**250 μm Aperture**	**100 μm Aperture**
5x	100 μm	50 μm	20 μm
10x	50 μm	25 μm	10 μm
20x	25 μm	17 μm	5 μm
50x	10 μm	5 μm	2 μm

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.



[1] Specifications are subject to change without any notice, [2] Measurements compared with a calibrated spectroscopic ellipsometer and XRD, [3] Average of standard deviation of mean value over 15 days. Sample: 1micron SiO_2 on Si wafer, [4] Standard deviation of 100 thickness measurements. Sample: 1micron SiO_2 on Si wafer, [5] 2*Standard-Deviation of daily average over 15 days. Sample: 1micron SiO_2 on Si wafer. * no IR filter embedded at the microscope.

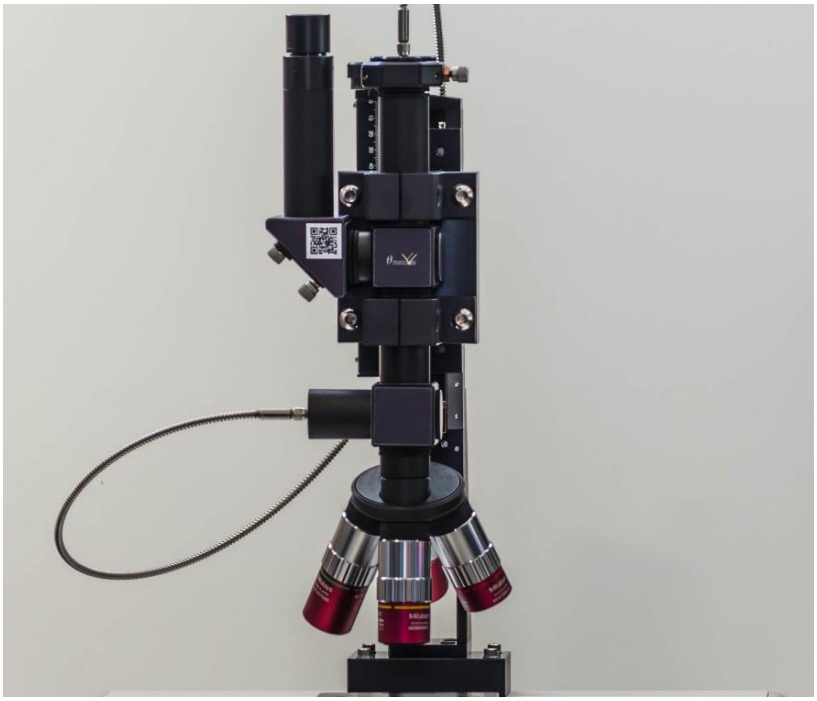
FR-Mic: Local characterization of coatings in the micron lateral scale

With **FR-Mic**, local measurement of film thickness, optical constants, reflectance, transmission, and absorbance across any spectral regime within UV / VIS / NIR spectral range, is just a matter of a click.

FR-Mic can be either mounted on FR-pRo or next to FR-pRo when large surfaces need to be characterized.

Applications

- **Univ. & Research labs**
- **Semiconductors** (Oxides, Nitrides, Si, Resists, etc.)
- **MEMS devices** (Photoresists, Si membranes, etc.)
- **LEDs, VCSELs**
- **Data Storage**
- **Anodization**
- **Hard/Soft coatings on curved substrates**
- **Polymer coatings,** adhesives, etc.
- **Biomedical** (parylene, balloon wall thickness, etc.
- And many more… (contact us with your requirements)



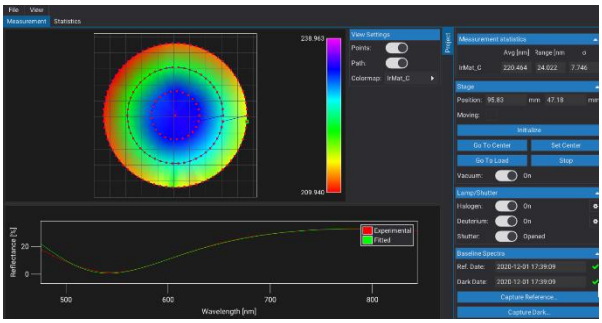
FR-Mic is the modular optical column for **fast & accurate** coating characterization applications that require **spot size as small as few micrometers**, Typical examples include (but not limited to): micro-patterned surfaces, rough surfaces and numerous others. It can be combined with a dedicated computer controlled XY stage, allowing the automated thickness & optical properties mapping of samples fast, easily and accurately.

FR-Mic provides:

- Real-time spectroscopic measurements
- Film thickness, optical properties, non-uniformity measurements, thickness mapping
- Imaging with an integrated, USB connected and high-quality color camera

Features

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



FR-Mic Specifications

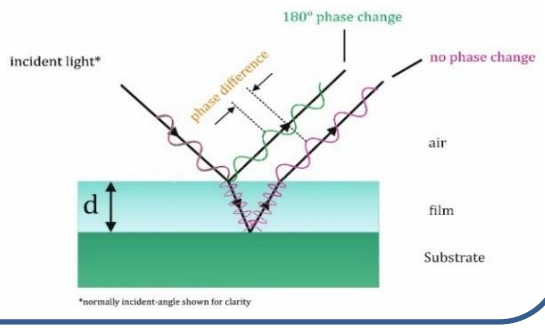
Model		UV/VIS	UV/NIR -EXT	UV/NIR-HR	D UV/NIR	VIS/NIR	D VIS/NIR	NIR	NIR-N2
Spectral Range (nm)		200 – 850	200 –1020	200-1100	200 – 1700	370 –1020	370 – 1700	900 – 1700	900 - 1050
Spectrometer Pixels		3648	3648	3648	3648 & 512	3648	3648 & 512	512	3648
Thickness range	5X- VIS/NIR	4nm – 60µm	4nm – 70µm	4nm – 100µm	4nm – 150µm	15nm – 90µm	15nm–150µm	100nm-150µm	4um – 1mm(SiO_2) 400um max(Si)
	10X-VIS/NIR 10X-UV/NIR*	4nm – 50µm	4nm – 60µm	4nm – 80µm	4nm – 130µm	15nm – 80µm	15nm–130µm	100nm–130µm	–
	15X- UV/NIR *	4nm – 40µm	4nm – 50µm	4nm – 50µm	4nm – 120µm	–	–	100nm-100µm	–
	20X- VIS/NIR 20X- UV/NIR *	4nm – 25µm	4nm – 30µm	4nm – 30µm	4nm – 50µm	15nm – 30µm	15nm – 50µm	100nm – 50µm	–
	40X- UV/NIR *	4nm – 4µm	4nm – 4µm	4nm – 5µm	4nm – 6µm	–	–	–	–
	50X- VIS/NIR	–	–	–	–	15nm – 5µm	15nm – 5µm	100nm – 5µm	–
Min. Thickness for n & k		50nm	50nm	50nm	50nm	100nm	100nm	500nm	–
FR-API		YES	YES	YES	-	YES	-		YES
Thickness Accuracy **		0.1% or 1nm				0.2% or 2nm		3nm or 0.3%	
Thickness Precision **		0.02nm				0.02nm		<1nm	5nm
Thickness stability **		0.05nm				0.05nm		<1nm	5nm
Light Source (NOT INCLUDED		Balanced Deuterium & Halogen (internal)				Halogen (internal), 3000h (MTBF)			
Material Database		> 700 different materials							

The measurement area (the area from which the reflectance or transmittance signal is collected) is relative to the objective lens and the FR-Mic's aperture size

Objective Lens	Spot Size (µm)		
	500 µm Aperture	250 µm Aperture	100 µm Aperture
5x	100 µm	50 µm	20 µm
10x	50 µm	25 µm	10 µm
20x	25 µm	17 µm	5 µm
50x	10 µm	5 µm	2 µm

Principle of Operation

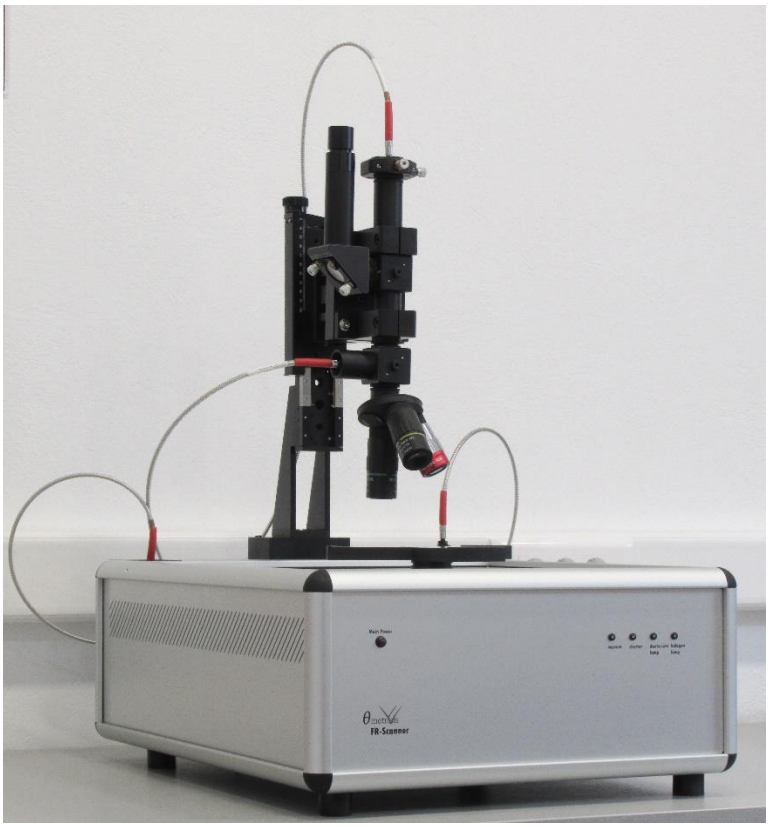
White Light Reflectance Spectroscopy (WLRS) measures the amount of light reflected from a film or a multilayer stack over a spectral range, with the incident light normal (perpendicular) to the sample surface.
The measured reflectance spectrum, produced by interference from the individual interfaces 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.



[1] Specifications are subject to change without any notice, * Reflective objective lens ** Measurements compared with a calibrated spectroscopic ellipsometer and XRD, Average of standard deviation of mean value over 15 days. Sample: 1micron SiO_2 on Si wafer, Standard deviation of 100 thickness measurements. Sample: 1micron SiO_2 on Si wafer, 2*Standard-Deviation of daily average over 15 days. Sample: 1micron SiO_2 on Si wafer.

FR-Scanner AIO-Mic-RΘ150: Automated & Fast mapping of coatings in the micron lateral scale

FR-Scanner-AIO-Mic-RΘ150 is a holistic platform for the fully-automated in-depth characterization of patterned single and multilayer coatings on wafers. Wafers of any diameter (300mm max) and shape can be accommodated on the vacuum chuck.
The tool is offered in an endless range of optical configurations within the 200-1700nm spectral range.



Applications

- **Semiconductors** (Oxides, Nitrides, Si, Resists, etc.)
- **MEMS devices** (Photoresists, Si membranes, etc.)
- **LEDs, VCSELs**
- **Data Storage**
- **Polymer coatings,** adhesives, etc.
- And many more… (contact us with your requirements)

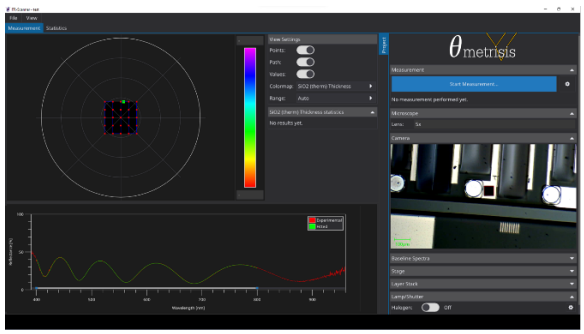
FR-Scanner-AIO-Mic-RΘ1500 is the modular platform that integrates in one unit state-of-the-art optical, electronic, and mechanical modules for the characterization of patterned thin and thick films.
The wafer is mounted on a vacuum chuck and the characterization is performed by a powerful optical module with a **spot size as small as a few micrometers.** The motorized and with ultra-high precision & repeatability RΘ stage provides coverage of every point on a wafer with diameter up to 300mm*.
FR-Scanner-AIO-Mic-RΘ150 provides:

- Real-time spectroscopic reflectance measurements
- Film thickness, optical properties, non-uniformity measurements, thickness mapping
- Imaging with integrated, and high-quality color camera
- Wide range of statistics for the parameters under characterization

** tools for mapping of coatings on wafers with larger diameter are also available (max 450mm)*

Features

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



Specifications

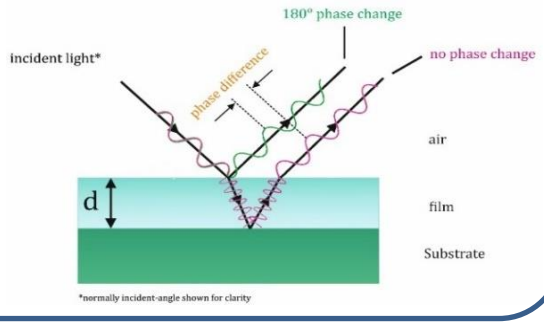
Model		UV/VIS	UV/NIR -EX	UV/NIR-HR	D UV/NIR	VIS/NIR	D VIS/NIR	NIR	NIR-N2
Spectral Range (nm)		200 – 850	200 –1020	200-1100	200 – 1700	370 –1020	370 – 1700	900 – 1700	900 - 1050
Spectrometer Pixels		3648	3648	3648	3648 & 512	3648	3648 & 512	512	3648
Thickness range (SiO_2)	5X- VIS/NIR	4nm – 60µm	4nm – 70µm	4nm – 100µm	4nm – 150µm	15nm – 90µm	15nm–150µm	100nm-150µm	4um – 1mm
	10X-VIS/NIR 10X-UV/NIR*	4nm – 50µm	4nm – 60µm	4nm – 80µm	4nm – 130µm	15nm – 80µm	15nm–130µm	100nm–130µm	–
	15X- UV/NIR *	4nm – 40µm	4nm – 50µm	4nm – 50µm	4nm – 120µm	–	–	100nm-100µm	–
	20X- VIS/NIR 20X- UV/NIR *	4nm – 25µm	4nm – 30µm	4nm – 30µm	4nm – 50µm	15nm – 30µm	15nm – 50µm	100nm – 50µm	–
	40X- UV/NIR *	4nm – 4µm	4nm – 4µm	4nm – 5µm	4nm – 6µm	–	–	–	–
	50X- VIS/NIR	–	–	–	–	15nm – 5µm	15nm – 5µm	100nm – 5µm	–
Min. Thickness for n & k		50nm	50nm	50nm	50nm	100nm	100nm	500nm	–
Thickness Accuracy **		0.1% or 1nm				0.2% or 2nm		3nm or 0.3%	
Thickness Precision **		0.02nm				0.02nm		<1nm	5nm
Thickness stability **		0.05nm				0.05nm		<1nm	5nm
Light Source		Deuterium & Halogen				Halogen (internal), 3000h (MTBF)			
R/Angle resolution		5µm/0.1°							
Material Database		> 700 different materials							
Wafer size		2in-3in-4in-6in-8in-300mm							
Scanning Speed		100meas/min (8'' wafer size)							
Tool footprint / Weight		650x500mm / 45Kg							
Power		110V/230V, 50-60Hz, 350W							

The measurement area (the area from which the reflectance signal is collected) is relative to the objective lens and the aperture size

Objective Lens Magnification	Spot Size 500 µm Apertrture	250 µm Aperture	100 µm Aperture
5x	100 µm	50 µm	20 µm
10x	50 µm	25 µm	10 µm
20x	25 µm	15 µm	5 µm
50x	10 µm	5 µm	2 µm

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.



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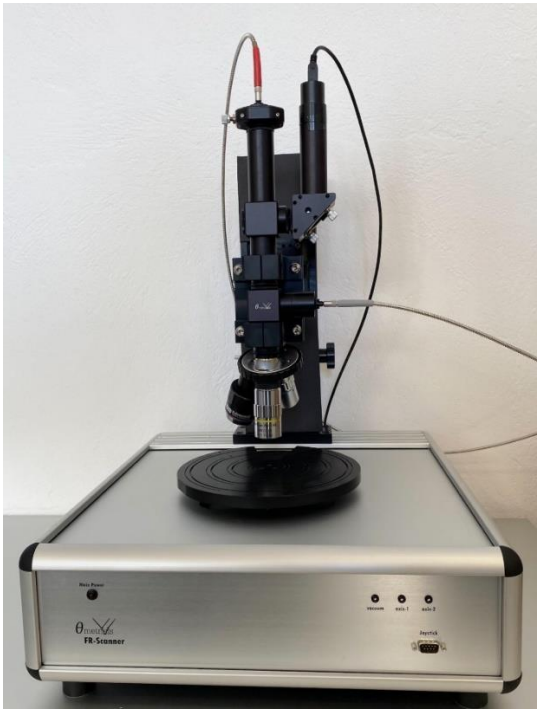
FR-Scanner-AIO-Mic-XY200: Automated & Fast mapping of coatings in the micron lateral scale

FR-Scanner-AIO-Mic-XY200 is a holistic platform for the fully-automated in-depth characterization of patterned single and multilayer coatings on wafers. It provides 200mm of travel along X and Y axes and is suitable for accurate measurements while the sample is secured on the stage through vacuum.

The tool is offered in an endless range of optical configurations within the 200-1700nm spectral range.

Applications

- **Univ. & Research labs**
- **Semiconductors** (Oxides, Nitrides, Si, Resists, etc.)
- **MEMS devices** (Photoresists, Si membranes, etc.)
- **LEDs, VCSELs**
- **Data Storage**
- **Polymer coatings,** adhesives, etc.
- And many more… (contact us with your requirements)



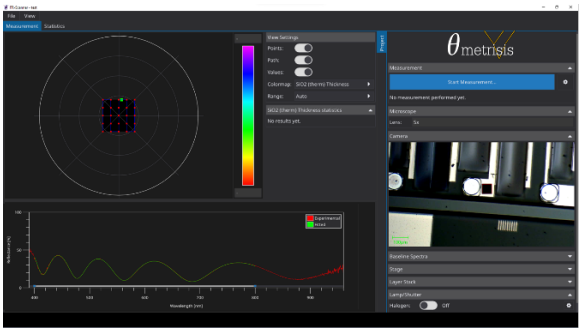
FR-Scanner-AllInOne-Mic-XY200 is the modular platform that integrates under the same roof state-of-the-art optical, electronic, and mechanical modules for the characterization of patterned thin and thick films. Typical examples include (but are not limited to): micro-patterned surfaces, rough surfaces, and numerous others.
The wafer is mounted on a vacuum chuck that supports any wafer size up to 200mm diameter. The characterization is performed by a powerful optical module with a **spot size as small as a few micrometers.** The motorized XY stage provides travel of 200mm on both axes with unprecedented specifications in speed, accuracy & repeatability.

FR-Scanner-AIO-Mic-XY200 provides:

- Real-time spectroscopic reflectance measurements
- Film thickness, optical properties, non-uniformity measurements, thickness mapping
- Imaging with an integrated, USB-connected, and high-quality color camera
- Wide range of statistics for the parameters under characterization

Features

- Single-click analysis (no need for initial guess)
- Dynamic measurements
- Optical parameters (n & k, color)
- Click2Move & Pattern alignment functions
- Multiple installations for off-line analysis
- Free of-charge Software update



Specifications

Model		UV/VIS	UV/NIR -EX	UV/NIR-HR	D UV/NIR	VIS/NIR	D VIS/NIR	NIR	NIR-N2
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Spectrometer Pixels		3648	3648	3648	3648 & 512	3648	3648 & 512	512	3648
Thickness range (SiO_2)	5X- VIS/NIR	4nm – 60µm	4nm – 70µm	4nm – 100µm	4nm – 150µm	15nm – 90µm	15nm–150µm	100nm-150µm	4um – 1mm
	10X-VIS/NIR 10X-UV/NIR*	4nm – 50µm	4nm – 60µm	4nm – 80µm	4nm – 130µm	15nm – 80µm	15nm–130µm	100nm–130µm	–
	15X- UV/NIR *	4nm – 40µm	4nm – 50µm	4nm – 50µm	4nm – 120µm	–	–	100nm-100µm	–
	20X- VIS/NIR 20X- UV/NIR *	4nm – 25µm	4nm – 30µm	4nm – 30µm	4nm – 50µm	15nm – 30µm	15nm – 50µm	100nm – 50µm	–
	40X- UV/NIR *	4nm – 4µm	4nm – 4µm	4nm – 5µm	4nm – 6µm	–	–	–	–
	50X- VIS/NIR	–	–	–	–	15nm – 5µm	15nm – 5µm	100nm – 5µm	–
Min. Thickness for n & k		50nm	50nm	50nm	50nm	100nm	100nm	500nm	–
Thickness Accuracy **		0.1% or 1nm				0.2% or 2nm		3nm or 0.3%	
Thickness Precision **		0.02nm				0.02nm		<1nm	5nm
Thickness stability **		0.05nm				0.05nm		<1nm	5nm
Light Source		Deuterium & Halogen				Halogen (internal), 3000h (MTBF)			
Min. incremental motion		0.6µm							
Stage repeatability		±2µm							
Absolute accuracy		±3µm							
Material Database		> 700 different materials							
Wafer size		2in-3in-4in-6in-8in							
Scanning Speed		100meas/min (8'' wafer size)							
Tool dimensions / Weight		700x700x200mm / 45Kg							

The measurement area (the area from which the reflectance signal is collected) is relative to the objective lens and the aperture size

Objective Lens Magnification	Spot Size 500 µm Apertrture	250 µm Aperture	100 µm Aperture
5x	100 µm	50 µm	20 µm
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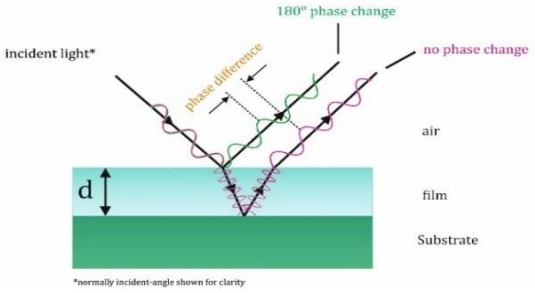
Principle of Operation

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.



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Accessories

FR-Thermal: Real-time Film Characterization during thermal treatment

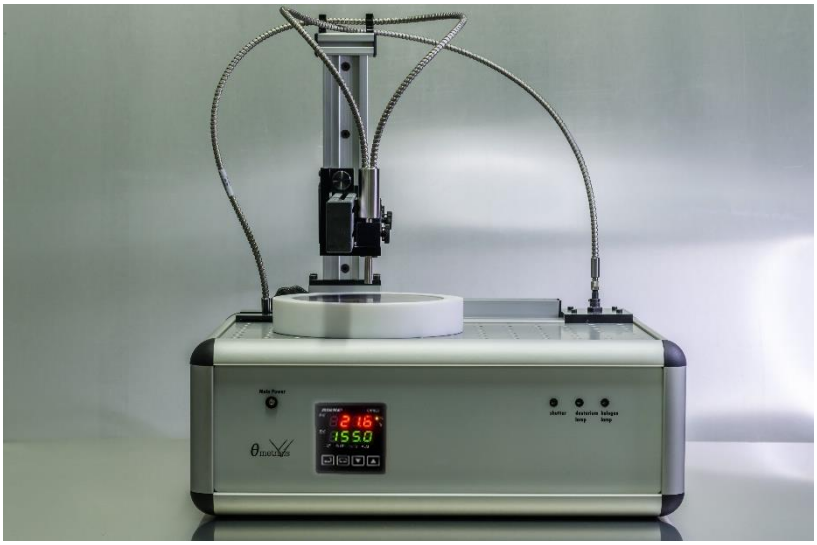
FR-Thermal kit is an accessory for FR-pRo tools. It consists of a 5inch wide hot-plate fully controlled through FR-Monitor software.
The user can set the temperature, the heating rate, thermal cycle conditions etc. and monitor in real-time the thickness & optical properties (e.g. refractive index) evolution vs. time and temperature of thin/thick films (e.g. polymers, photoresists).

Applications

- Characterization of polymers/photoresists
- Physicochemical properties
- Dynamic film thickness measurements
- Dynamic Reflectance measurements

Features

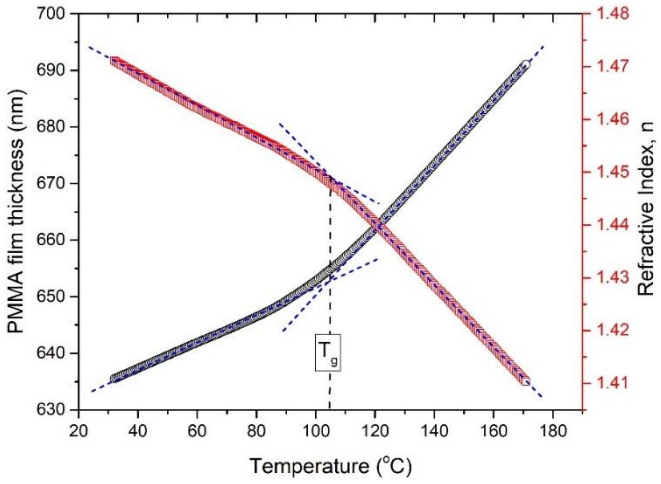
- Temp Range: room temp - 150°C*
- Manual/Auto control
- 5inch heating area



By using FR-Thermal and the especially developed algorithms included in FR-Monitor, **physicochemical properties of the films**, such as:

- **glass transition temperature** (T_g^{film}), and
- **thermal degradation temperature of polymer films** (T_d^{film})

are measured for any film with thickness > 200nm.

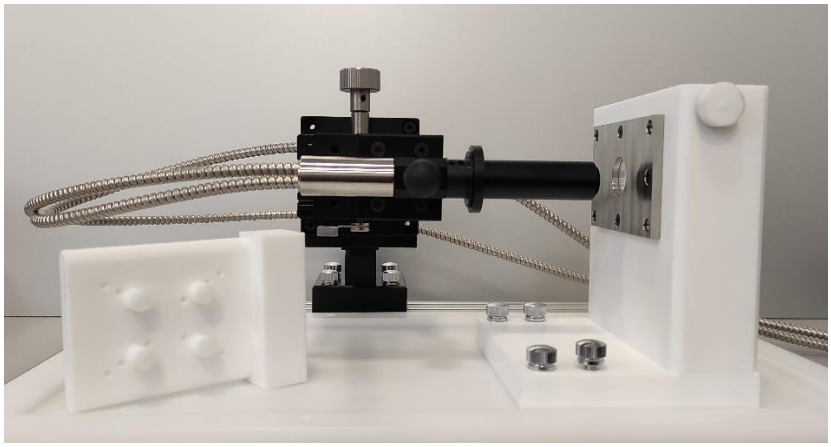


Simultaneous monitoring of film thickness and optical properties changes of a PMMA film during heating. The Glass Transition temperature (T_g^{film}) is 105°C.

*The hot plate can be designed for temperatures up to 350°C. Specifications are subject to change without any notice.

FR-Liquid: In-situ Monitoring and Characterization of coatings immersed on liquids

FR-Liquid is an accessory for the real time monitoring, e.g. swelling or dissolution, of thickness and optical constants (n&k) of thin/thick films during processing in liquids (e.g. water, organic solvents).
FR-Liquid can be used with any FR-pRo tool and at any spectral range thanks to its quartz optical port.



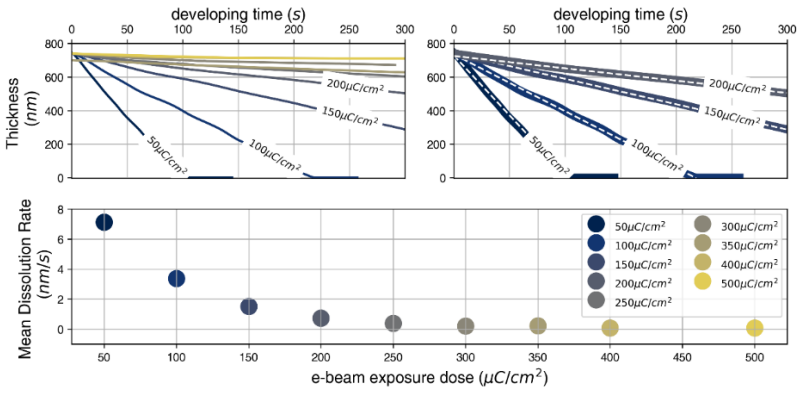
FR-Liquid consists of a PTFE (Teflon) cell and a holder to accommodate the sample under test. PTFE, due to its properties (hydrophobic, chemical and thermal resistant) make suitable the use of FR-Liquid for a wide range of liquids. Optical measurements with the FR-Basic tool are possible due to the optical window design on the cell, which establishes the non-contact between the optical probe and the liquid.
FR-Liquid supports also the use of external micropumps, for the circulation of the liquids.

Applications

- In-Situ Measurements
- Materials Characterization
- Polymers/Photoresists Characterization
- HardCoats
- Semiconductor
- Non Metal films

Features

- Teflon cell: 110x35x130 mm
- Optical window: 18 mm (diameter)
- Liquid capacity: 30 - 40 ml
- Sample holder for samples of any shape in the 30x45 mm range.



Thickness evolution during the development step corresponding to all selected exposure doses, and (top-right) only to high development rates. (bottom) The mean dissolution rates expressed as a function of e-beam exposure dose.

FR-IntSphere: Total & Diffuse Spectral Reflectance Measurements

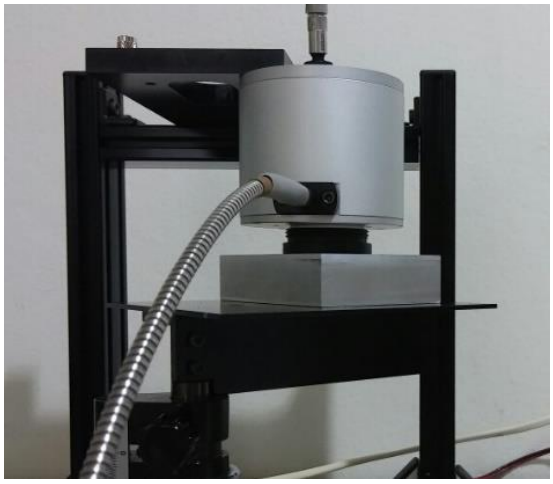
FR-IntShpere kit is an accessory for FR-pRo tools for: **Total**, **Diffuse**, **Specular** Reflectance / Transmittance measurements. The kit consists of an integrating sphere of 50mm diameter, the appropriate optical fibers and holders. It is fully controlled through FR-Monitor software for the calculation and analysis of all parameters (reflectance, color, etc.).

Applications

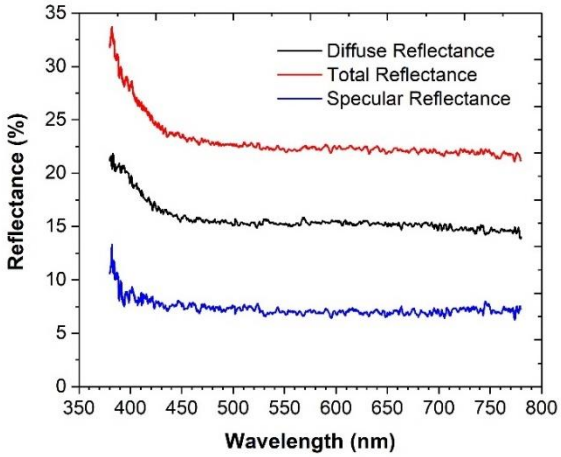
- Photovoltaics
- Diffuse materials
- Textiles
- Automotive paints
- Gemology
- General Lighting

Features

- Total / Diffuse / Specular Reflectance/Transmittance
- Haze
- Irradiance
- Color properties (L*a*b*)
- Wide spectral range
- Ideal for manufacturing
- Wide range of light sources, optical elements, & other configurations.



FR-IntSphere kit along with a FR-pRo tool is a concrete solution for reflectance measurements, without any need of additional components. The integrating sphere is made of a highly reflective, Lambertian surface (PTFE), with a sample port diameter of 10mm, compact, and easy to operate.
The entrance and the exit ports are at **8 degrees** from normal incident to block the specular reflection of the sample by using a light trap and measure the **Diffused reflectance**. By replacing the light trap with a gloss trap (same material as the internal of the sphere), the **Total reflectance** is measured.

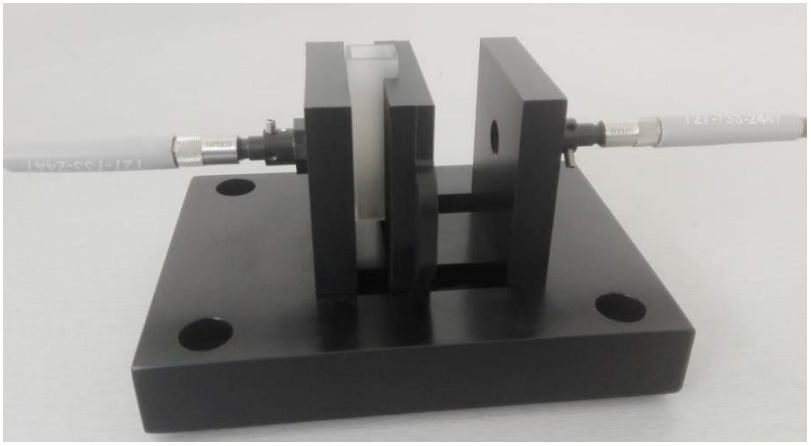


Total, Diffuse and Specular Reflectance measurements of a painted aluminum sample, as they were measured using an FR-pRo tool equipped with an integrating sphere.

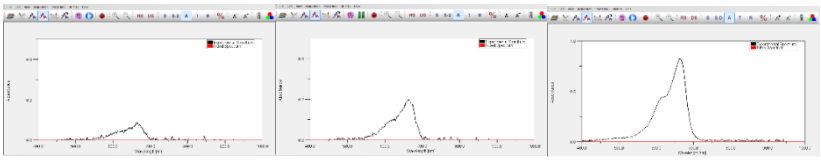
*Specifications are subject to change without any notice.

Film/Cuv Holder: Absorbance & Transmittance of liquids and films

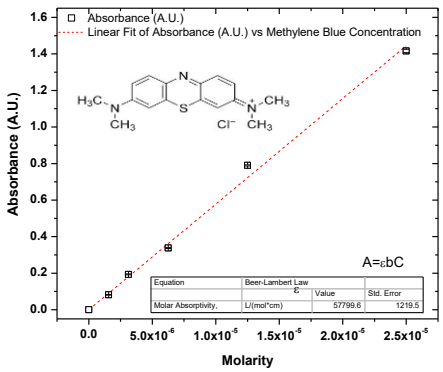
Transmittance measurements of liquids and coatings is a quite standard method for the characterization of the related materials.
Film/Cuv holder is designed to cover the needs for the characterization of both liquids and solid samples (semi-transparent and transparent samples of supported and un-supported (suspended) films).
It is offered either in 2W (two ports configuration) or in 4W (four ports configuration).



The **Film/Cuv Holder** is secured on FR-pRo tools and couples to the light source and spectrometer via standard SMA-905 optical fiber. Thanks to its unique design, it can be easily operated, it saves precious lab space and ensures absolute transmittance and absorbance measurements of high repeatability of either liquids or coatings. The holder can accommodate standard 1-cm cuvettes and solid samples with total thickness up to 10mm.



1.56*10^{-6}M 3.12*10^{-6}M 1.25*10^{-5}M



Absorbance curve of Methylene Blue at 668nm at 25°C

Applications

- Transmittance
- Absorbance
- Film Thickness

Features

- Footprint: 130x95x20 mm
- Film/Cuv Holder: 60x50x50mm
- SMA905 Fiber Connectors

FR-Mic-Adaptor: Optical microscope adaptor for spot size down to 5μm

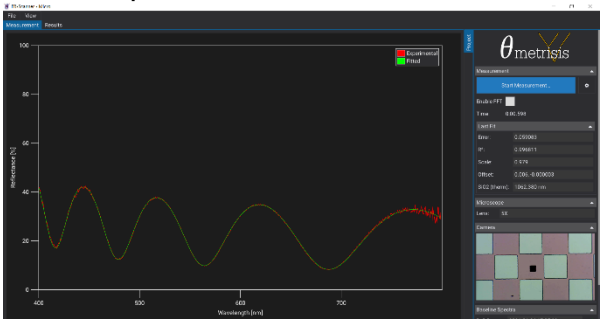
FR-Mic-Adaptor is an FR-pRo accessory for use with trinocular microscopes with C-mount. It is the ideal accessory for applications that require spot size as small as very few microns.
With FR-Mic, local film thickness, optical constants, reflectance, transmission, and absorbance measurements across the spectral range of FR-pRo and microscope, is just a matter of a click.

Applications

- **Universities & Research labs**
- **Semiconductors** (Oxides, Nitrides, Si, Resists, etc.)
- **MEMS devices** (Photoresists, Si membranes, etc.)
- **LED**
- **Data Storage**
- **Anodization**
- **Hard/Soft coatings on curved substrates**
- **Polymer coatings,** adhesives, etc.
- **Biomedical** (parylene, balloon wall thickness, etc.)

And many more…

With FR-Mic-Adaptor, **any trinocular optical microscope with C-mount is converted into a powerful coating characterization tool** capable to measure film thickness down to 20nm.
FR-Mic-Adaptor comes with a high-resolution USB camera that allow simultaneous observation of the probed area and local characterization of coatings.
For its operation, FR-Mic-Adaptor, needs to be connected to an appropriate FR-pRo unit.
The installation of the accessory is straight forward and does not affect the specifications and operation of the optical microscope.



* The FR-pRo should support the spectral range of the microscope. Because of the limitations of the lenses the min. wavelength of operation is usually 400nm.

FR-Focusing Module: 150μm spot size module

FR-Focusing Module is an accessory for optical measurements on coatings where a small (<150μm) spot size is required. The particular module is fully compatible with all FR-pRo tools operating in VIS spectral range and is easily mounted on the reflection probe by the user.

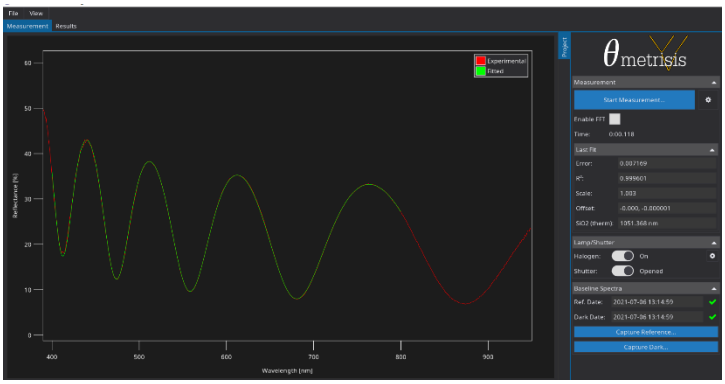
Applications

- Characterization of areas with small size or patterned areas
- Rough coatings
- Uneven samples
- Scattering samples

Features

- Type: Triplet Achromatic Lens
- Wavelength range: 400-700nm
- Diameter: 12mm
- Focal Length: 20mm
- Spot size: < 150um
- Mounting: Secure and precise mounting on the reflection probe

The **FR-Focusing Module** is easily attached on the reflection probe of FR-pRo tool and cover the visible range (380-700nm wavelength). In the standard configuration, the spot size becomes <150μm in diameter and allows for the characterization of coatings with moderate roughness.
Additional configurations can be provided upon request.



Thickness measurement of SiO_2 film on Silicon substrate.
Thickness: 1051.4nm.

XY-M75 / XY-M100: Two-axes Linear Translation stage for FR-tools

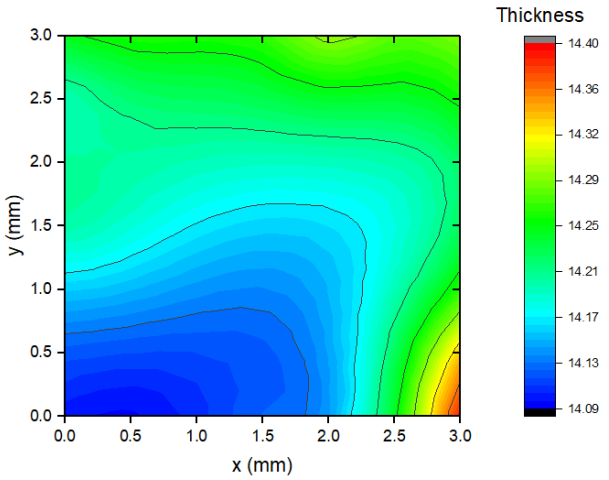
XY-M linear stage is a dedicated accessory for FR-pOrtable and any FR-pRo tool. It allows the manual thickness & optical properties mapping of samples fast, easily and accurately.

The linear stage is offered in two travel ranges (75X55mm, 100X100mm) and is suitable for Reflectance, Transmittance measurements through the embedded optical window of up to 4-inch wafers.

Both XY-M stages (75X55mm and 100X100mm) are equipped with a knob and rulers to facilitate the movement at certain coordinates. The stage is mounted on the FR-tool and secures the probe at the center of the stage.

Features

- Manually controlled (knob on the top)
- Travel range: 100X100mm
- Sample: Dia. 100mm (max)
- Spring Clips
- Reflectance & Transmittance
- Stage size: 285x205x330mm



Thickness mapping (30mmX30mm) of SU-8 film spin coated on Si wafer with measurement step of 5mm, is illustrated. The thickness (scale bar in µm) varies from 14.09 µm to 14.40 µm.

XY-LargePlatform: XY manual platform with 300x200mm traveling distance

XY-LargePlatform is an accessory for FR-pOrtable and FR-pRo tools. It allows the manual thickness & optical properties mapping of large samples fast, easily and accurately.

The platform can be moved manually at any point within an area of 300X200mm and comes with engraved patterns of the standard wafers to facilitate fast characterization of coatings on any wafer or other substrate with dimension up to 300mm.

The **XY-LargePlatform** is a cost-effective solution for fast characterization of a small number of points of coatings of substrates with large footprint. The platform moves fast and manually and the user can bring under the probe any point of the substrate. It supports (upon request) reflectance and transmittance measurements.

Features

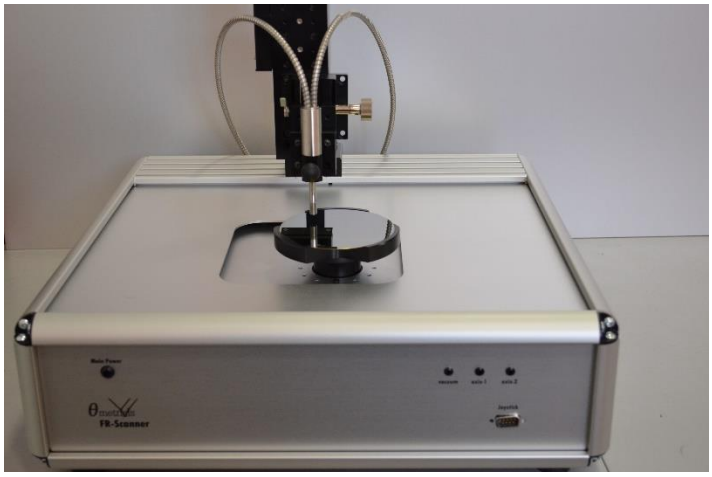
- Manually controlled
- Travel range: 300X200mm
- Sample: Dia. 300mm (max)
- Reflectance & Transmittance
- Stage size: 285x205x330mm

XY-A100: Motorized stage for fast mapping of coatings at Cartesian coordinates

XY-A100 linear stage is a dedicated accessory for FR-pRo tools. The linear stage which provides a 100mm of travel along X and Y is suitable for Reflectance measurements while the sample is secured through vacuum.

XY-A100 linear stage allows for the automatic, through FR-Monitor, thickness & optical properties mapping of samples fast, easily and accurately.

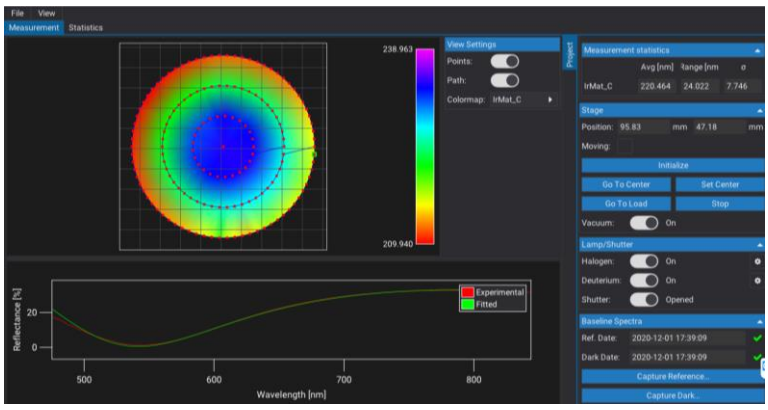
Other scanning ranges are available upon request.



The **XY-A100 stage** is compatible with any FR-pRo tool and can be employed in the characterization of coatings on any substrate (wafer, square, arbitrary shape) up to 100X100mm in size. The sample is hold down through vacuum provided by any standard pump, or vacuum line.

Features

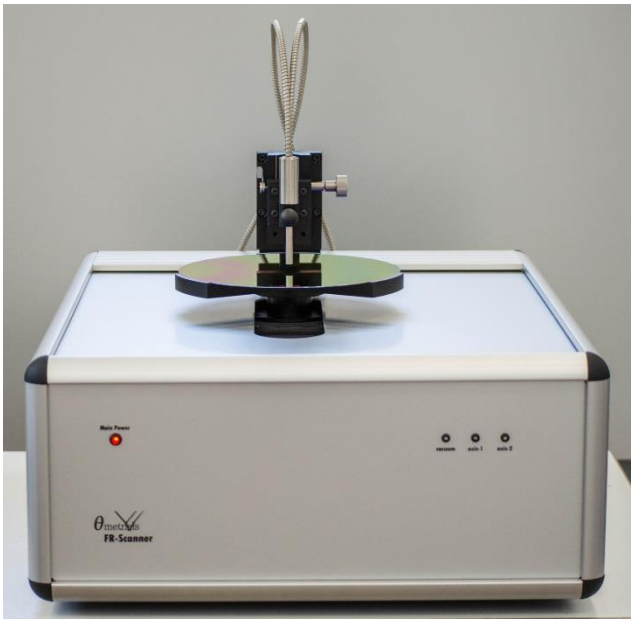
- Travel range: 100X100mm
- Sample: Dia. 100mm (max)
- Accuracy: 5μm in each axis
- Reflectance
- Stage size: 430x430x300mm



Thickness mapping of a 4inch Si wafer coated with a photoresist film. The statistical results (number of points, mean thickness, standard deviation etc.) are listed in the tab at the top right.

RΘ-A150: Motorized stage for fast mapping of coatings at Polar coordinates

RΘ-A150 is a powerful motorized stage operating in Polar coordinates. It can accommodate any standard wafer up to 300mm in diameter. It is operated through any FR-pRo unit and it comes along with one vacuum chuck.



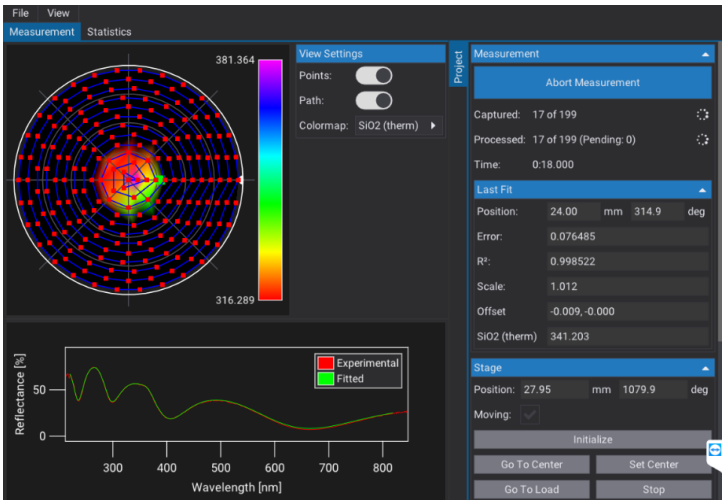
Applications

- Mapping of thickness, refractive index, colour etc of any standard wafer up to 300mm in diameter.
- Characterization of areas with small size or patterned areas
- Rough coatings
- Uneven samples
- Scattering samples

Features

- 300measurements /min on 8inch wafer
- Accuracy: 5μm / 0.1°
- User Friendly software for fast routine operation.
- FR-Mic module can be further attached for ultra-small spot size

The **RΘ-150 stage** is a stable-top unit for the automatic characterization of coatings on wafers. It is operated through any FR-pRo unit and operates either under FR-Monitor or via the independent software that has been especially developed for daily routine use. The maximum scanning speed on 8inch wafers is 300points/min and 625measurements/90sec.



*Available in RΘ-200 configuration also

RΘ-A300-HW: Motorized stage for fast mapping of coatings on Heavy Substrates

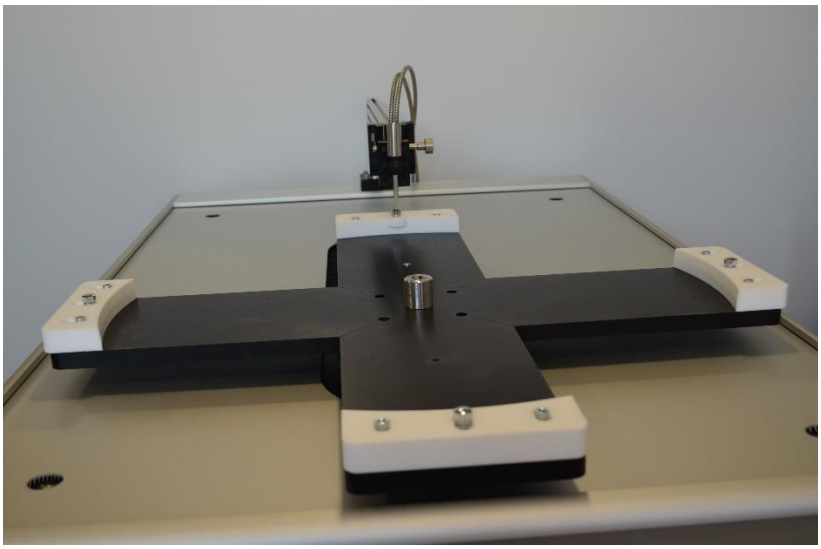
ARΘ-A300 HW is a powerful motorized stage operating in Polar coordinates. It can accommodate any standard wafer up to 300mm in diameter. It is operated through any FR-pRo unit and it comes along with one vacuum chuck.

Applications

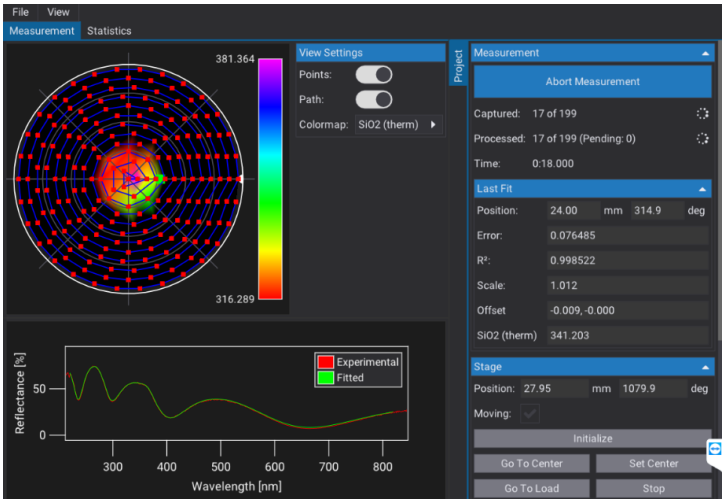
- Mapping of thickness, refractive index, colour etc of any standard wafer up to 300mm in diameter.
- Characterization of areas with small size or patterned areas
- Rough coatings
- Uneven samples
- Scattering samples

Features

- 300measurements /min on 8inch wafer
- Accuracy: 5μm / 0.1°
- User Friendly software for fast routine operation.
- FR-Mic module can be further attached for ultra-small spot size



The **RΘ-150 stage** is a stable-top unit for the automatic characterization of coatings on wafers. It is operated through any FR-pRo unit and operates either under FR-Monitor or via the independent software that has been especially developed for daily routine use. The maximum scanning speed on 8inch wafers is 300points/min and 625measurements/90sec.



*Available in RΘ-200 configuration also

FR-pRo R/T/C: Reflectance, Transmittance and Color characterization

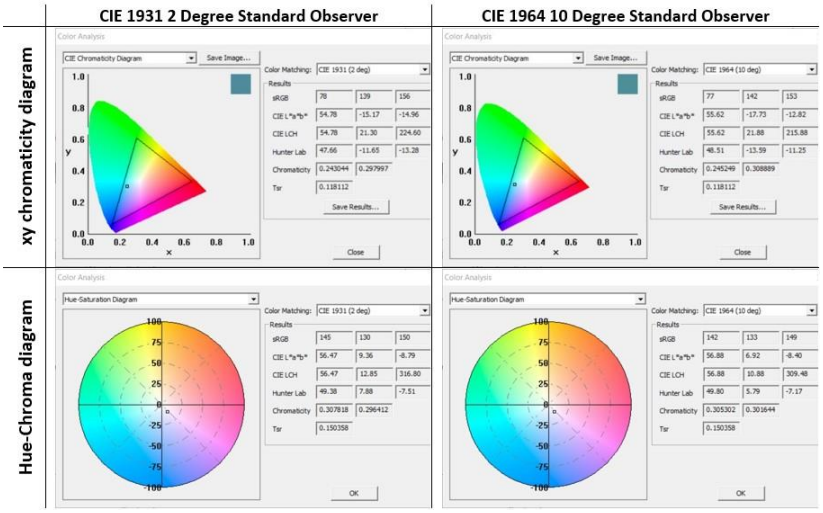
Color science has significant importance in manufacturing industry and research.

FR-pRo R/T/C is a tailored tool for the simultaneous characterization of Reflectance, Transmittance and Color measurements with one-click.

Color spaces available:
CIEL*a*b*
CIELCh,
Hunter Lab

Applications

- **AR coatings on glass lenses**
- **MEMS devices** (Si membranes, etc.)
- **LED, OLED**
- **Hard/Soft coatings on curved substrates**
- **Polymer coatings,** adhesives, etc.
- **Biomedical** (parylene, balloon wall thickness, etc.)
- **And more**... (contact us with your requirements)



FR-pRo R/T/C tool relates the reflectance spectra taken upon a sample to color tristimulus values: XYZ, using two established international conventions:

- 2° standard observer (CIE, 1931)
- 10° standard observer (CIE, 1964)

providing

- chromaticity diagrams, and
- the following list of parameters:

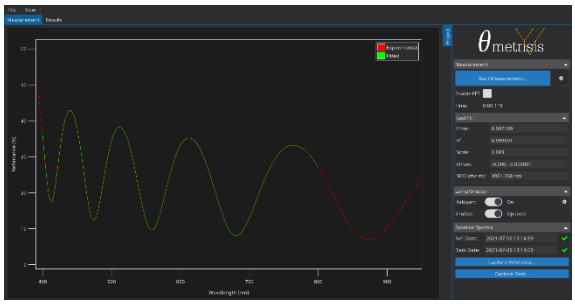
sRGB	R	G	B
CIE L*a*b*	L*	a*	b*
CIE LCH	L	C	H
Hunter	L	a	b
Chromaticity	x	y	

Depending on the application, different configurations can be implemented in the tool such as:

- **Contact probe** for curved surfaces such as glass lenses
- **Integration Spheres** for diffuse & total reflectance (di:8°, de:8° geometry)

Features

- Single-click analysis (no need for initial guess)
- Dynamic measurements
- Optical parameters (n & k, color)
- Save videos for presentations
- 700+ non-identical materials
- Multiple installations for off-line analysis
- Free of-charge Software update



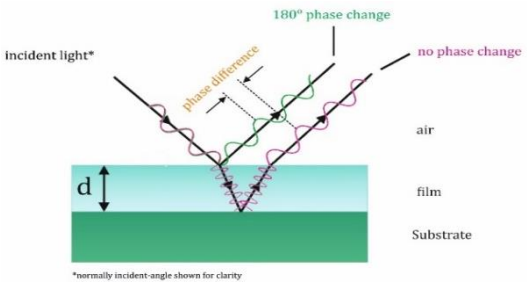
Specifications

Spectral Range (nm)	370 –1020
Pixels	3648
Thick. range (SiO_2)	12nm – 100um
Min. Thick. for n&k	100nm
Thick. Accuracy *,**	1nm or 0.2%
Thick. Precision*,**	0.02nm
Thickness stability *,**	0.05nm
Spot size (diameter)	350um (smaller options upon request)
Material Database	> 700 different materials

	Optical probe (**standard**) / Contact probe	Integrating sphere (50mm diameter)
Illumination/viewing system	Specular reflectance (0°)	di:8°, de:8° (diffused illumination, 8° viewing
Illumination area	0.3mm (standard)	10 mm (port size)
Observer	2° / 10°	
Illuminant	D65 (standard – others available after request)	
Color matching	CIE 1931, CIE 1964	
Colorimetric Data	L*a*b*, L*C*h*, Hunter Lab, sRGB, xy, Tsr (Total solar reflectance)	
Chromaticity Diagrams	CIE 1931, CIE 1964	

Principle of Operation

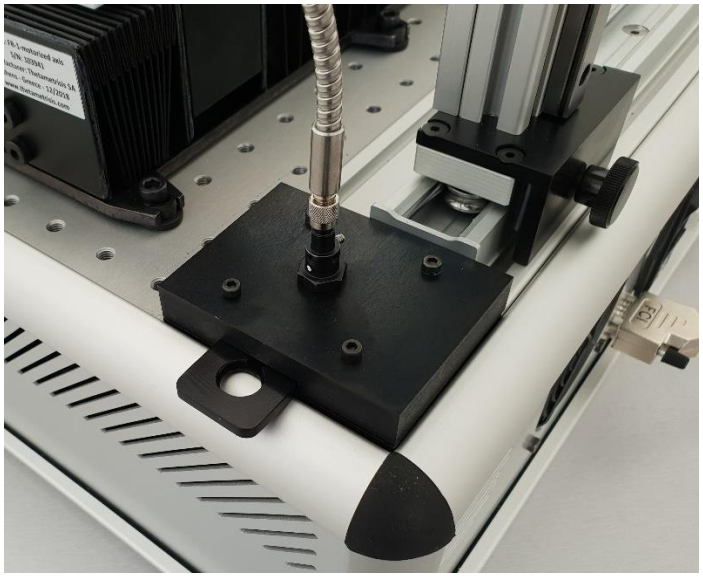
White Light Reflectance Spectroscopy (WLRS) measures the amount of light reflected from a film or a multilayer stack over a range of wavelengths, with the incident light normal (perpendicular) to the sample surface.
The measured reflectance spectrum, produced by interference from the interfaces is being used to determine the thickness, optical constants (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, [1]Measurements compared with a calibrated spectroscopic ellipsometer and XRD, [2]Average of standard deviation of mean value over 15 days. Sample: 1micron SiO_2 on Si wafer, [3]Standard deviation of 100 thickness measurements. Sample: 1micron SiO_2 on Si wafer, [4]2*Standard-Deviation of daily average over 15 days. Sample: 1micron SiO_2 on Si wafer, [5]Without the stage

FR-pRo-FH: Filter holder for FR-pRo units

FR-pRo-FH is a filter holder that can be mounted on the light emission port of any FR-pRo unit.
It can accommodate any light filter (low-pass, high-pass, band-pass) and configure the emission spectrum accordingly.



FR-pRo-FH can accommodate any commercially available filter of either 1/2inch or 1inch diameter. The filter can be either low-pass, high-pass or band-pass.

Features & Apps

- Optical and Thickness measurements at selected spectral regimes
- Easily mounting on any FR-pRo tool
- Ideal for the evaluation of photoresists films
- Fully configurable by the usage of any commercially available low-pass, band-pass and high-pass filter

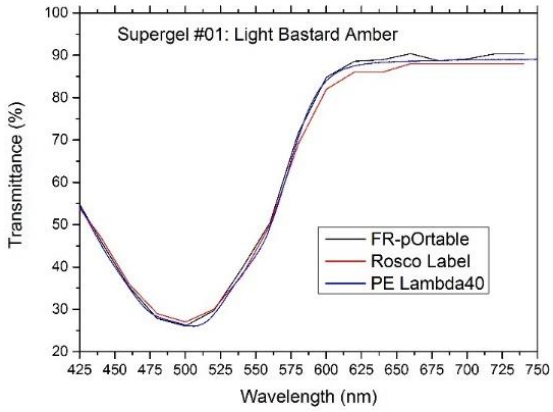
FR-pOrtable-TR: Module for transmission measurements

Transmittance measurements of coatings is a quite standard method for the characterization of the related materials. The Transmittance kit for FR-pOrtable is a module designed to cover the needs for the characterization of coatings (semi-transparent and transparent samples of supported and un-supported (suspended) films).

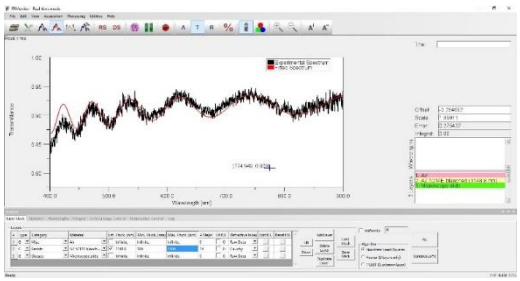
Features

- Manually controlled (knob on the top)
- Travel range: 100X100mm
- Sample: Dia. 100mm (max)
- Spring Clips
- Reflectance & Transmittance
- Stage size: 285x205x330mm

The Transmittance module is secured below the base of FR-pOrtable and is equipped with a light source similar to the one used for the reflectance measurements. The light from the light source is aligned to the central fiber of the reflection probe.
The light source is powered by the FR-pOrtable through the D-sub connector on the top and is controlled by the same FR-Monitor software.



Transmittance spectrum of a color filter compared with manufacturer's data and a high precision tabletop spectrometer



Thickness measurement of an AZ5214 resist film spin-coated on amicroscope slide. Thickness: 1.1 μm

ContactProbe-ST: Thickness measurements of coatings at the field

ContactProbe-ST is a handheld accessory for thickness and optical measurements of coatings in the field.
Thanks to its design, the ContactProbe-ST can be easily attached on the reflection probe of any ThetaMetrisis' tool, allowing fast, easy and accurate measurements.

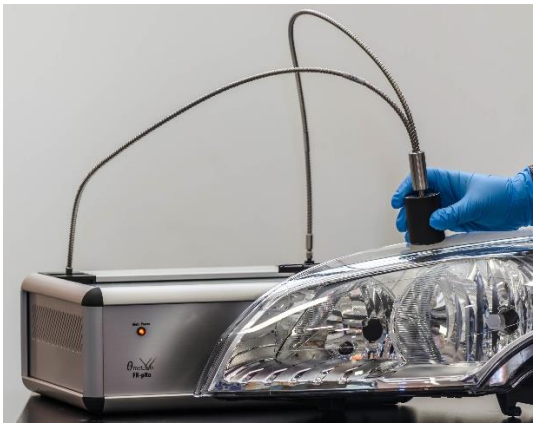
Ideal for curved samples and surfaces.

Features & Apps

- Optical and Thickness measurements in the field
- Easily mounting on any FR-tool
- Soft spacer to protect the surface under test
- Blocks any ambient light
- Applicable at any flat and curved surfaces
- Ideal for eye glass industry, Aerospace and Automotive industry

Contact probe-ST is a unique accessory for reflectance measurements of curved samples, e.g. lenses. It is equipped with a soft rubber ring to secure the correct distance between the probe and the point under characterization that does not harm the sample. The ContactProbe-St can be mount on any FR-pRo or FR-pOrtable tool and is operated by the standard FR-Monitor software.

Accuracy*: 0.5nm
Precision*: 0.5nm
Stability*: 0.5nm
* in terms of spectrum and depends on material



Characterization of a multi-layer stack on a lens for automotive lamp.

Biosensing kit: Real-time & label-free monitoring of biomolecular interactions

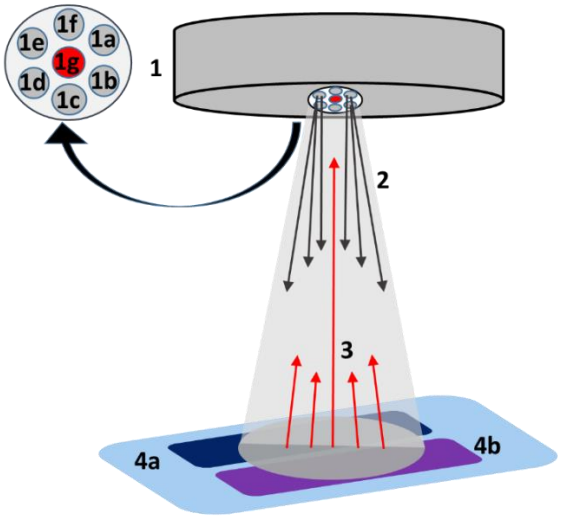
The Biosensing kit is fully compatible with FR-pRo and FR-pOrtable tools and is used for real-time and label-free monitoring of immunoreactions.
The miniaturized (5X15mm footprint) biochips, after appropriate bio-functionalization meets the needs for measurement of critical for human health biomarkers, as well as for harmful substances in food.

Applications

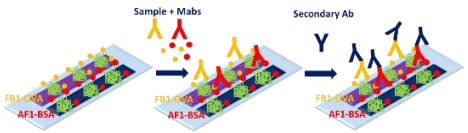
- Label-free Biosensors
- Monitoring of kinetics of bioreactions
- Point-of-Need determinations

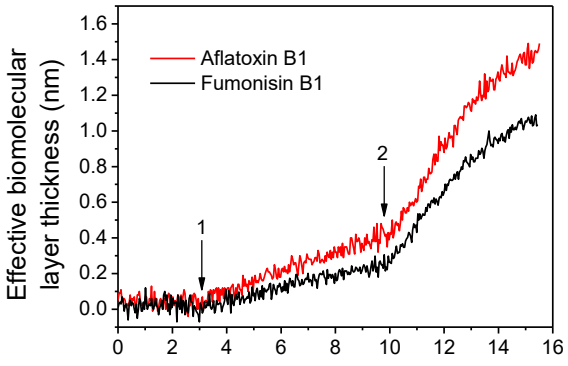
Features

- Ultra-miniaturized footprint
- Single analyte determinations
- Mutli-analyte determinations
- Fully compatible for operation with micropumps



The biosensing kit consists of a docking station especially designed to accommodate the biosensing chips and a number of appropriately fabricated Si chips and the related fluidic cells.
The biosensing kit was been extensively employed in the fast, accurate any with high dynamic range of a) a large variety of critical for human health biomarkers (T-PSA, f-PSA, CRP, d-Dimer, PCT, IL-6 etc.) and b) a large number of harmful substances in food; pesticides, mycotoxins and allergens.





OptMic-ES: Standard Optical microscope for R&D needs

OptiMic-ES is a standard trinocular microscope operating in reflectance mode. It is used for standard inspection of samples and can be coupled with FR-uProbe for reflectance and thickness measurements with a very small spot-size.

Applications

- Standard inspection of samples
- Measurement of thickness at a very small area

Features

- Spectral range: 400-1700nm
- Magnification 50X-400X
- 12V50W halogen lamp with brightness control
- Transmittance mode (optional)
- Integrated field diaphragm, aperture diaphragm and puller type polarizer.
- Stage travel range: 63mmX50mm

OptiMic-ES is a standard trinocular microscope that can operate both in reflectance and transmittance modes and serves the characterization of coatings on both reflective and transparent substrates. It is ready for mounting of FR-uProbe or FR-MicAdapter modules for the local characterization of coatings in terms of film thickness, reflectance, transmittance, refractive index.

OptiMic-ES is equipped with all standard features of optical microscopes such as:

- Trinocular inclined 30˚
- Integrated field diaphragm, aperture diaphragm and puller type polarizer.
- Achromatic lenses: 5X/NA0.12/WD/26.1mm, 10X/NA0.25/WD20.2 mm, 40X/NA0.60/WD3.98 mm
- Ground-glass and yellow, green and blue filters

OptMic-200: Optical microscope for the inspection of large samples

OptiMic-200 is a top-class trinocular microscope operating in reflectance mode. It is equipped with large manual stage with large travel range to support the inspection of any wafer size up to 8inch diameter.

Applications

- Standard inspection of samples
- Measurement of thickness at a very small area

Features

- Spectral range: 400-1700nm
- Magnification 50X-500X
- 12V50W halogen lamp with brightness control
- Integrated field diaphragm, aperture diaphragm and puller type polarizer.
- Stage travel range: 204X204mm

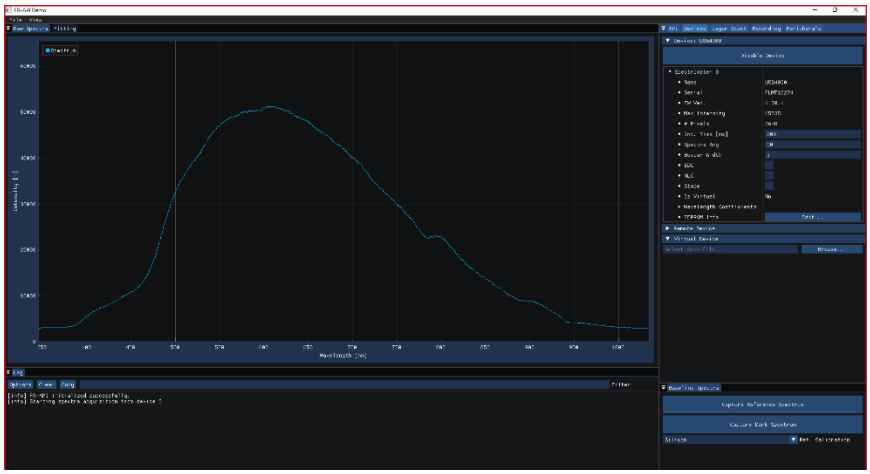
OptiMic-200 is a top-class trinocular microscope that operate in reflectance mode and serves the characterization of coatings on wafers with diameter up to 8inch. It is ready for mounting of the FR-uProbe or FR-MicAdapter modules for the local characterization of coatings in terms of film thickness, reflectance, transmittance, refractive index.

OptiMic is equipped with:

- Coaxial coarse/fine focus system, with tensional adjustable and up stop, minimum division of fine focusing: 0.8μm
- Trinocular inclined 30˚
- Integrated field diaphragm, aperture diaphragm and (Y,B,G, ground glass) switching device.
- Push-pull type analyzer and polarizer.
- Achromatic lenses: 5X/NA0.12/WD26.1mm, 10X/NA0.25/WD20.2 mm, 20X/NA/WD8.8mm, 50X/NA0.70/WD3.7mm

FR-API: Application Programming Interface (API) for the control of FR-tools by other software

FR-API is a powerful API for the configuration and control of FR-tools by third party software.
It comes with FR-API demo, a Windows software that is open for debug for easier integration of FR-API in third-party software.
FR-API comes with virtual license and a set of reflectance spectra for fast off-line software development.



FR-API uses C++ internally and the publicly exposed functions are written in C. The API user (developer) can create wrapper functions in his/her language of choice in order to call FR-API functions. Use of complex C structures as function arguments has been kept to the minimum. Most API function arguments are POD types or pointers to POD types.

FR-API currently supports the Windows x64 (distributed as a DLL) platform

ThetaMetrisis currently provides wrappers for the following programming languages:

- C/C++: header (.h) + library (.lib) files

Applications

- Control of FR-tools through other software
- Integration of FR-tools in larger systems
- FR-tool operation in in-line applications

Features

- Control of light sources
- Control of spectrometers in UV-VIS-NIR spectral ranges
- Control of FR-Mic

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