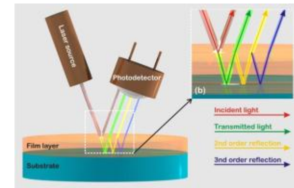
ThetaMetrisis APPLICATION NOTE #006



Thickness measurement of Thick films by White Light Reflectance Spectroscopy (WLRS)

Goal: The accurate measurement of the thickness of thick films on a reflective substrate.

Means & Methods: WLRS is introduced for the measurement of film thicknesses in the case of thick transparent films (>100μm). All measurements were performed with an FR-Basic tuned to operate in the 540-1000nm spectral regime. The reflection probe had an active spot size of 1mm in diameter. The samples were microscope glasses and Si wafers coated with PMMA and SU-8 films via spin coating and via spreader. For the reference measurements, a highly reflective Al coated mirror (NT01-913-533, Edmund Optics) was used.

Results: In fig. 1 the reflectance spectrum from a PMMA film spin coated on a standard microscope glass is shown. Since the substrate is transparent, a special holder preventing the transmitted light from the back side of the substrate to be reflected and collected by the reflection probe was employed. The reflectance fringes have small amplitude due to small refractive index contrast between PMMA and the substrate but even in this case the film thickness is calculated accurately. In figs. 2-4 film thickness measurements of SU-8 films applied on Si substrate are shown. Film thicknesses of even higher than 400μm are measured accurately. Higher film thickness could be measured by further tuning of the spectral region to smaller spectral regime e.g. 850-1000nm.

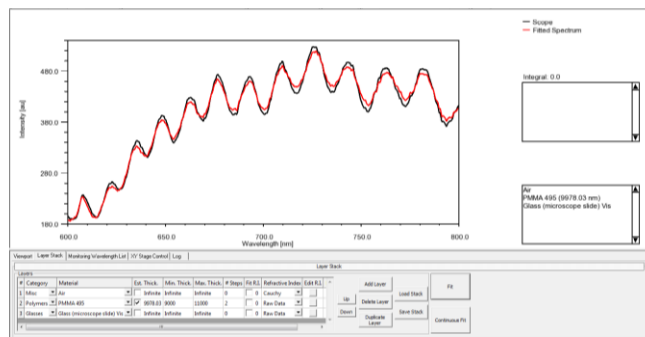


Figure 1: Experimental and Fitted reflectance spectra from a ~10μm PMMA on microscope glass (**raw data**). Black line: sample, Red line: fitting

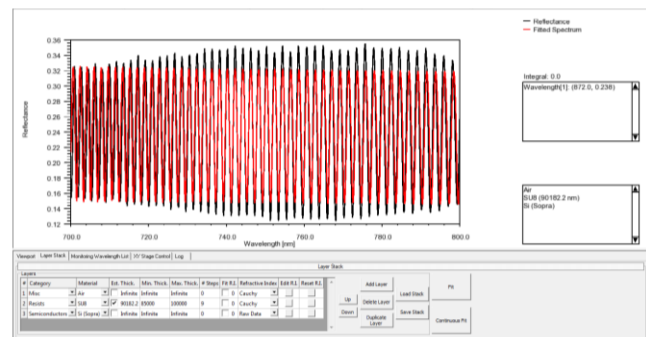


Figure 2: Experimental and Fitted reflectance spectra from a ~90μm SU-8 film spin coated on Si wafer (**absolute reflectance data**). Black line: sample, Red line: fitting

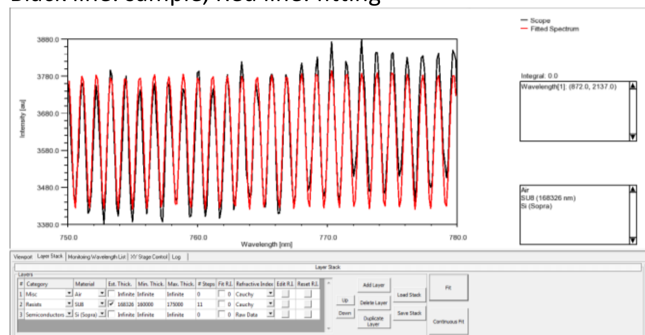


Figure 3: Experimental and Fitted reflectance spectra from a ~170μm SU-8 film applied on Si wafer via spreader (**absolute reflectance data**).

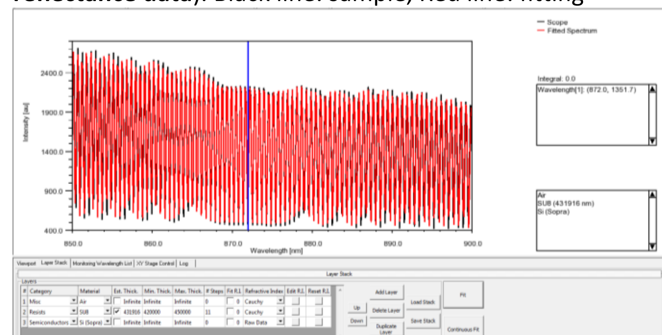


Figure 4: Experimental and Fitted reflectance spectra from a ~430μm SU-8 film applied on Si wafer via spreader (**raw reflectance data without normalization**).

Conclusions: The accurate measurement of thickness of thick films (even >0.4mm) was demonstrated.

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