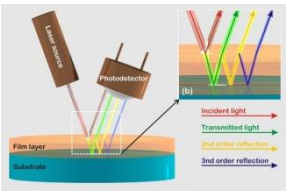
ThetaMetrisis APPLICATION NOTE #037

Thickness determination and reflectance spectra of 2D Molybdenum oxide film



Introduction: Since the discovery of graphene, there has been escalating interest in the so called two-dimensional (2D) materials due to their very promising electrical, chemical, optical, thermal, and mechanical properties for a wide range of diverse applications [1]. A variety of processes are currently used for the fabrication of 2D materials, and thus there is an urgent need for accurate, fast and versatile characterization methods. Precise number-of-layers of a special category of 2D materials, Transition Metal Dichalcogenides (TMDs), and more specifically MoO_3 on top of a SiO_2, using a **FR-µProbe** tool, is demonstrated here.

Means and Methods: Thin films of MoO_3 on top of a SiO_2 on Silicon, were deposited by PECVD. In **Figure 1**, reflectance spectra in the MoO_3 deposited areas are shown (red line), in contrast with no deposited areas (black line). In the inset images, as shown from the FR-µProbe camera, the measurement spots can be seen.

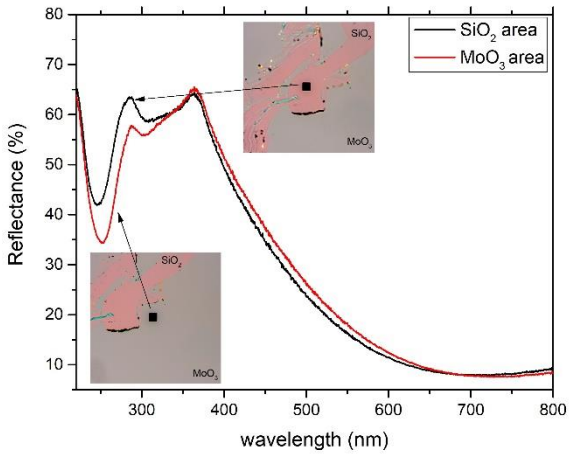


Figure 1. Absolute reflectance spectra of MoO_3 and SiO_2 film, obtained at the microscopic areas as shown in the inset images.

In Figure 2, a screenshot of the FR-Monitor software is illustrated, where the experimental reflectance spectra (black line) and the fitted line (red line) for the thickness calculation of the Molybdenum oxide film is shown. On the right, the thickness values for both MoO_3 and SiO_2 are shown, **0.9nm** and 107.6nm respectively.

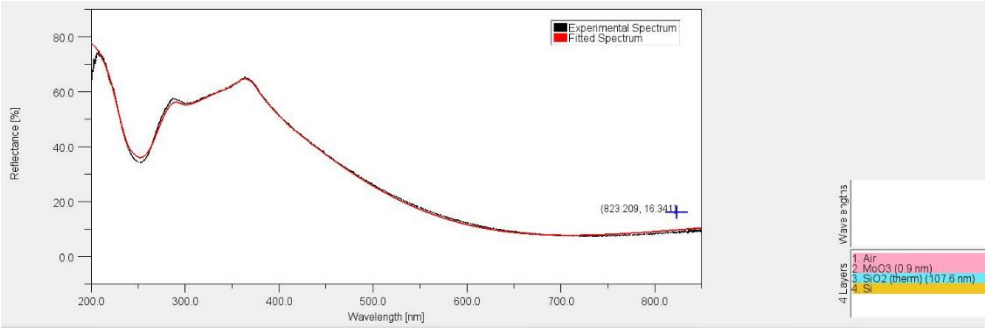


Figure 2. Experimental and fitted reflectance spectra of MoO_3 on top of a SiO_2 film, at the 200-850nm wavelength range.

Concussions: ThetaMetrisis' **FR-uProbe** tool is a unique powerful tool for the local measurement of thickness(es) of layers with spot size down to 2µm. Thanks to its modular design can be attached on any trinocular optical microscope enhancing this way the microscope capabilities without any effect on its performance.

References:

[1] H. Zhang et al., "Measuring the refractive index of highly crystalline monolayer MoS2 with high confidence.," Sci. Rep., vol. 5, p. 8440, 2015.