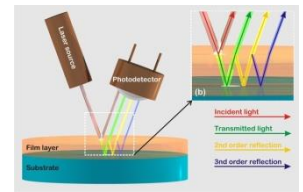


ThetaMetrisis APPLICATION NOTE #036

Suspended Active-Silicon membrane thickness measurements for MEMS applications, at a 25µm spot size.



Introduction: Silicon-based sensors have been broadly implemented in different MEMS applications for their high-performance, low cost and small size. Thickness determination of the active-Si layer either suspended on patterned Si membranes or on SOI based sensors is crucial for the control of the performance of the final platform [1]. Here we have measured such film thicknesses on a MEMS pressure sensor, using the **FR-µProbe** tool with a 250µm aperture size, attached on a Leica DM LM optical microscope. Measurements performed using the 10X objective lens, which along with the selected aperture size, corresponds to a **25µm spot size (area of measurement)**.

Means and Methods: Typical experimental reflectance spectra (black line) obtained, and fitted reflectance spectra (red line) as recorded by the FR-Monitor software, are illustrated in the figures below. **Figure 1**, shows measurement on the SOI area of the sensor, where simultaneous thickness measurement of Active-Silicon and the Buried Oxide was performed. The thickness value of the SiO₂ thin film measured at **759.2nm**, while the Si film on top at **5320.1 nm**.

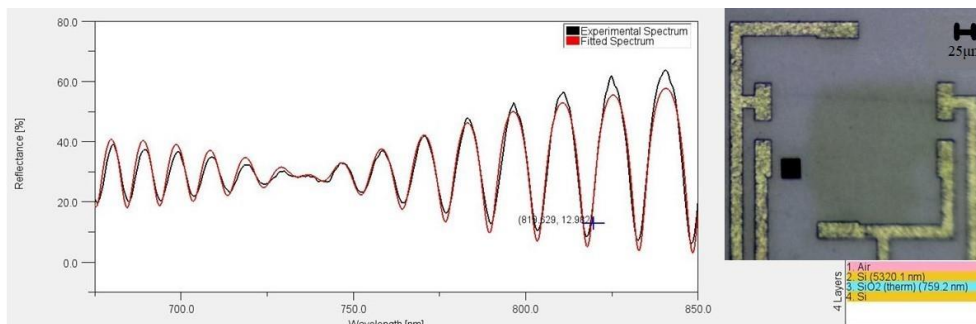


Figure 1. Experimental and fitted reflectance spectra of the SOI area on a MEMS pressure sensor and the thickness values measured.

Figure 2, shows measurement on the patterned suspended Silicon area of the sensor, where again the simultaneous thickness measurement of Active-Si and Buried Oxide was performed. The thickness value of the SiO₂ thin film measured to be the same at **759.2nm**, while the Si film on top at **5329.1 nm, 9nm higher** than in the SOI area.

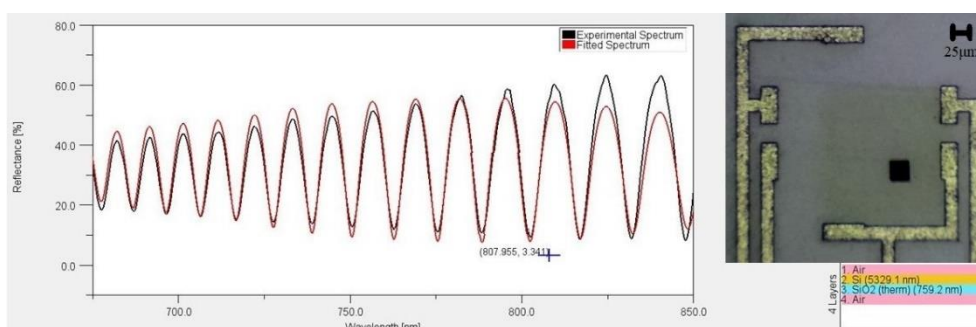


Figure 2. Experimental and fitted reflectance spectra of the suspended Silicon area on a MEMS pressure sensor and the thickness values measured.

Conclusions: ThetaMetrisis' **FR-µProbe** 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] J. Su, X. Zhang, G. Zhou, C. Xia, W. Zhou, and Q. Huang, "A review: crystalline silicon membranes over sealed cavities for pressure sensors by using silicon migration technology," J. Semicond., vol. 39, no. 7, pp. 1–7, 2018.