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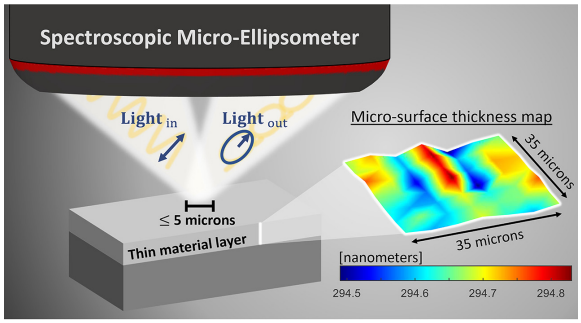
A simple, compact, and low-cost instrument turns an ordinary microscope into a fast, accurate thin-film analyzer.



Ellipsometers characterize thin materials by analyzing the changes in light properties that result from reflection at oblique angles of incidence. Semiconductors, photovoltaics, optical coatings, flat panel displays, and biological materials are a few of the technical and research fields that make use of these optical instruments. However, commercial ellipsometers have a limited lateral resolution of tens of microns or exhibit very slow rates of data acquisition.

Ralfy Kenaz and Ronen Rapaport developed a microscope-integrated ellipsometer that enables highly accurate and fast characterizations of micro-structures with a lateral resolution as high as 2 microns.

“Our novel ellipsometer demonstrates similar accuracy to state-of-the-art commercial instruments while achieving at least ten times higher lateral resolution along with record-fast data acquisition,” said Kenaz.

The patented spectroscopic micro-ellipsometer consists of a generic microscope to which typical optical components and a spectrograph with a two-dimensional detector array are added. The instrument uses a standard, incoherent, broadband light source with the desired spectral range.

The spectroscopic micro-ellipsometer can be integrated into any commercial optical microscope’s phototube port without disturbing its capabilities, transforming the most basic imaging equipment into a sophisticated optical characterization tool.

“This work promises a paradigm shift in the capabilities of ellipsometry in research and technology,” said Kenaz. “It paves the way for simple, accurate, and fast characterization of microstructures such as exfoliated, two-dimensional van der Waals materials, meta-materials, minuscule biological structures, and many other micron-scale systems that previously were not conveniently addressable through ellipsometry.”

Source: “Mapping spectroscopic micro-ellipsometry with sub-5 microns lateral resolution and simultaneous broadband acquisition at multiple angles,” by Ralfy Kenaz and Ronen Rapaport, *Review of Scientific Instruments* (2023). The article can be accessed at https://doi.org/10.1063/5.0123249.