

From single flakes to wafer scale – Current applications of Imaging Spectroscopic Ellipsometry (ISE)

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Imaging Spectroscopic Ellipsometers (ISE) combine the benefits of ellipsometry and optical microscopy in a single device. The unification of the two technologies creates a unique metrology tool that redefines the limits of both ellipsometric measurements and polarization-contrast microscopy. Imaging Spectroscopic Ellipsometry (ISE) is an established method for characterizing graphene [1] and two-dimensional materials [2],[3],[4]. For microcrystals of novel materials, the determination of their optical properties is becoming increasingly important. For isotropic or uniaxial materials, spectroscopic Delta and Psi maps are often sufficient. To determine the optical properties of anisotropic Van der Waals Materials, Imaging Müller Matrix measurements may be required.

Ellipsometric contrast Micrographs (ECM), enable a fast, noncontact, wafer-Scale, atomic Layer resolved Imaging of graphene and 2D-Materials by Ellipsometric Contrast Micrographs [5]. The technology also works on different substrates like Si / SiO₂ with native oxide layer, Cu without oxide layer or GaAs.

The presentation will demonstrate how current developments in Imaging Spectroscopic Ellipsometry fills the gap in characterization methods for production-accompanying analysis/metrology of wafer size graphene and 2D material samples.

References

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- [3] P.G. Zotev et al., Laser Photonics Rev. 17 (2023), 2200957B.
- [4] B. Choi et al. Nature Communications (2026).
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Figures

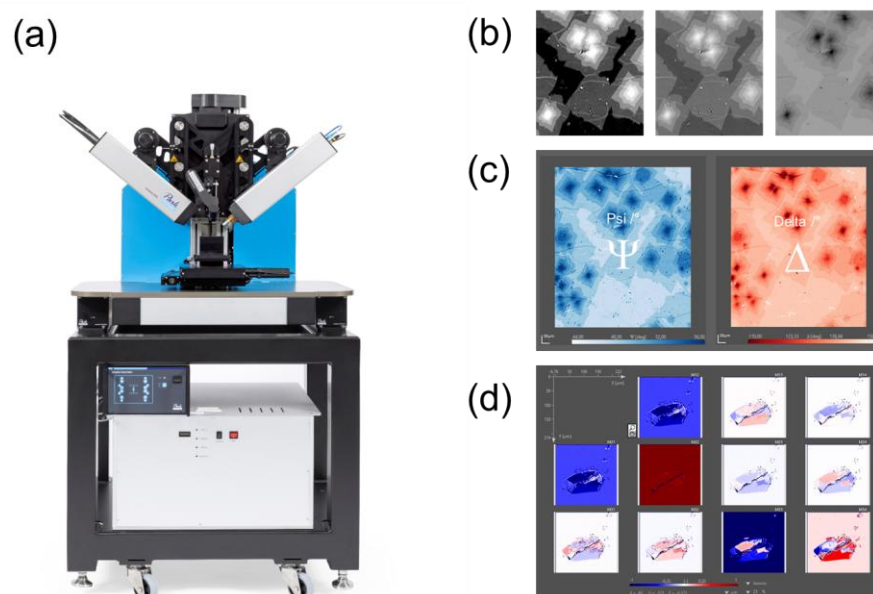


Figure 1: Spectroscopic Imaging Ellipsometer (a), Ellipsometric Contrast Micrographs (b), micro maps of Delta and Psi (c) and different elements of the Mueller Matrix (d).