

Pump-probe spectroscopic ellipsometry

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Brief description of the available set up:

The femtosecond pump-probe ellipsometer measures the polarization response of planar samples which allows the calculation of the optical constants of the material in an excited state and during the time evolution of these states [1-2]. It is a P-S-C_R-A ellipsometer. Other characteristics of the systems are:

Wavelengths pump beam: 266 nm, 400 nm or 800 nm

Spectral range probe: 350 nm - 700 nm (1.8 eV - 3.5 eV) based supercontinuum generation in CaF₂ or similar

Spectral bandwidth: approx. 25meV (prism based spectrometer)

Probe spot size at the sample: <200um

Time range: 0-5 ns

Time resolution: 100 fs

Dynamic range: 10000:1

Characteristic of the pulses from the laser: <35 fs, 1 KHz rep.rate. (Coherent Astrella)

Angle of incidence: 20-90degree

Sample requirements:

Sample size: 50 um or bigger

Roughness < 350 nm

Preferentially thin films on transparent substrates that can be homogeneously excited by the pump

The transient ellipsometry spectra are obtained from a series of background-and luminescence corrected reflectance spectra.

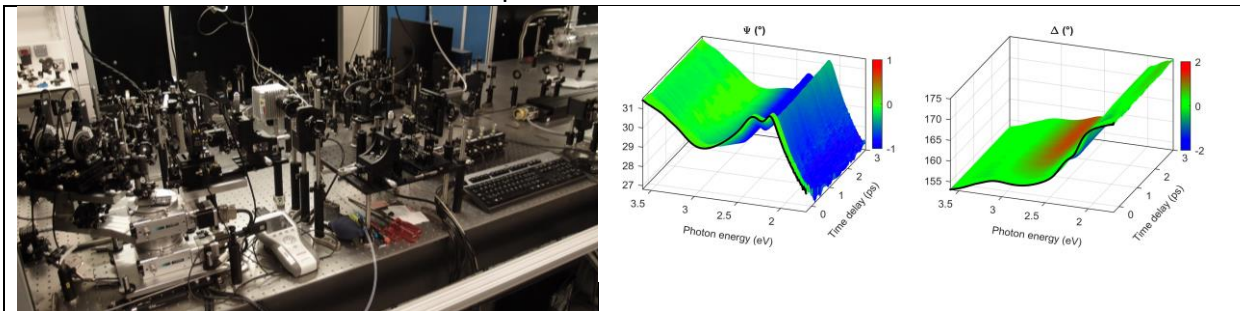


Fig 1: Set up for pump-probe spectroscopic ellipsometry in operation in the E1 experimental hall.

References

- [1] S. Espinoza, S. Richter, M. Rebarz, O. Herrfurth, R. Schmidt-Grund, J. Andreasson, and S. Zollner. Transient dielectric functions of Ge, Si, and InP from femtosecond pump-probe ellipsometry. *Appl. Phys. Lett.* 115, 052105 (2019); doi: 10.1063/1.5109927
- [2] S. Richter, O. Herrfurth, S. Espinoza, M. Rebarz, M. Kloz, J. A. Leveillee, A. Schleife, S. Zollner, M. Grundmann, J. Andreasson, and R. Schmidt-Grund. Ultrafast dynamics of hot charge carriers in an oxide semiconductor probed by femtosecond spectroscopic ellipsometry. *Eprint arXiv:1902.05832v1*