STEALTH TECHNOLOGY-BASED TERAHERTZ FREQUENCY-DOMAIN ELLIPSOMETRY INSTRUMENTATION

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We present a terahertz (THz) frequency-domain spectroscopic (FDS) ellipsometer design (Fig. 1) which suppresses formation of standing waves by use of stealth technology approaches. The strategy to suppress standing waves consists of three elements: geometry, coating and modulation [1]. The instrument is based on the rotating analyzer ellipsometer principle and can incorporate various sample compartments, such as a superconducting magnet, in-situ gas cells or resonant sample cavities, for example. A backward wave oscillator and three detectors are employed, which permit operation in the spectral range of 0.1–1 THz (3.3–33 cm^{-1}or 0.4–4 meV). The THz frequency-domain ellipsometer allows for standard and generalized ellipsometry at variable angles of incidence in both reflection and transmission configurations. The methods used to suppress standing waves and strategies for an accurate frequency calibration are presented. Experimental results from dielectric constant determination in anisotropic materials, and free charge carrier determination by FDS ellipsometry, and resonant-cavity enhanced optical Hall effect [2] experiments are discussed. Examples include silicon and sapphire optical constants, free charge carrier properties of two dimensional electron gas in group-III nitride high electron mobility transistor structure, and in conductive PEDOT thin polymer films.

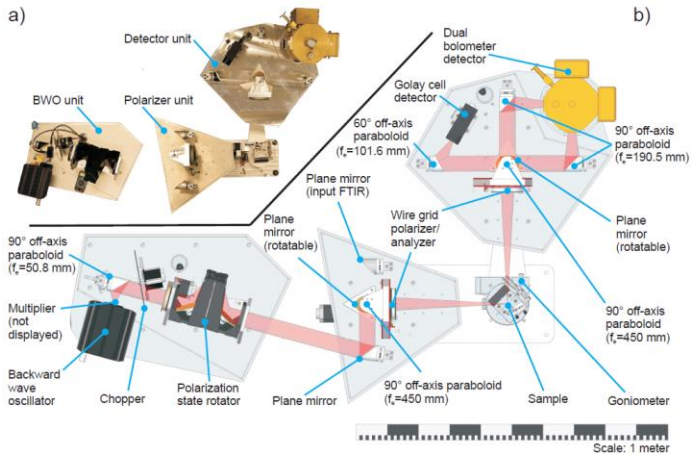

Fig. 1. a) photograph and b) schematic drawing of the THz FDS ellipsometer with major components indicated and without absorbing foam sheets and housing.

Keywords: Terahertz; Stealth technology based;

References

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