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A reflection setup for Terahertz time-domain spectroscopy

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Abstract :

Traditional THz time-domain spectroscopy (THz-TDS) has proven itself an invaluable tool to investigate semiconductors and technologically important polymers. Although it has found application in examining biological samples, a problem with water absorption has always hampered its usefulness. We propose a novel reflection THz time domain spectroscopy setup, which will allow the investigation of adsorbed biological samples in an aqueous environment. This setup can also easily be extended to be able to perform ellipsometry measurements on relevant thin films.A traditions THZ-TDS setup is normally used for transmission spectroscopy, but this limits the samples that can be investigated, since aqueous samples will absorb all the THz radiation. The same holds for samples that are optically dense in the terahertz regime. This problem can be overcome by performing the measurements in reflection. This of course has its own challenges such as the alignment of a calibration sample relative to the sample under investigation (within 4μm). One possibility to overcome this difficulty is to perform ellipsometry measurements. In ellipsometry, instead of looking at a calibration sample and a sample, one simply looks at the s- and p-polarisation of the radiation reflected from the surface of a sample. In essence one looks to derive the nature of a material by observing how it changes the polarization of incoming light. In the case of THz-TDS this process is simplified, since via a Fourier Transform it is possible to extract both the phase and amplitude information in the frequency domain for a single measurement.

Award :

yes

Level :

MSc

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Paper :

no

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