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NANOPTICUM

NEW COMBINATION – IMAGING ELLIPSOMETRY AND TERAHERTZ SPECTROSCOPY

- Technical integration of a terahertz spectrometer into an Imaging ellipsometer
- Research highlight – Imaging ellipsometry on graphene
- New series - Thesis on imaging ellipsometry

Integration of a terahertz spectrometer in a nanofilm_ep3sw

Dear Sir/Madame,

The technical focus in this issue is on the integration of a time domain terahertz spectrometer into a nanofilm_ep3sw. The development was initialised by Prof. Datta, Saha Institute of Nuclear Physics, Kolkata.

The scientific foci of this month's newsletter are the characterization of graphene and self- assembling monolayers. A paper about "imaging ellipsometry on graphene" was selected as our "research highlight".

Also, with the work of D. Peng from University of Michigan in Ann Arbor about the characterization of self-assembling monolayers, we start a new series: Theses on imaging ellipsometry.

Please enjoy our new Nanopticum.

Best regards

Yours,

June
2011

17.- 20.07: ECOF 12, Sheffield (GB)
www.shu.ac.uk/ad/conference21/ecof12/

28.08.- 2.09: Microscopy Conference 2011, Kiel (DE)
www.conventus.de/index.php?id=dge_welcomenote

5.09. - 9.09: ECIS 11, Berlin (DE)
www.ecis2011.org/

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TECHNICAL INTEGRATION OF TIME DOMAIN TERAHERTZ SPECTROMETER INTO AN IMAGING ELLIPSOMETER

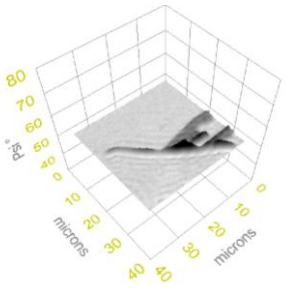
The first technical integration of a time domain terahertz spectrometer into the setup of an imaging ellipsometer (nanofilm_ep3sw) promises a new quality of understanding on the air/water interface.

The basic principle of time-domain THz spectroscopy is the following: a sub-picosecond pulse of electromagnetic radiation passes through a sample and gets its time profile changed compared to the one of the reference pulse. Terahertz radiation is iteracting with very low frequency phenomena such as rotations in small molecules and soft lattice vibrations in dielectrics. Current applications include collective vibrational modes in biological molecules and detecting the complex conductivity of semiconductor.

We acknowledge the great conceptual and scientific support of Prof. Alokmay Datta, Saha Institute of Nuclear Physics, Kolkata, India in the design of this instrument. Prof. Datta is also the first user of this combined system. We are looking forward to the results and hope to be able to report on interesting scientific findings of his group in future newsletters.

Integration of a new developed time domain terahertz spectrometer

learn more ...



- Psi-map of a graphene flake.

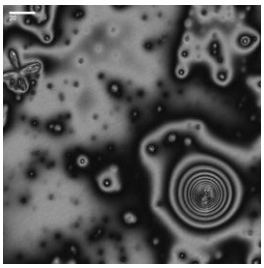
learn more ...

VIEW ON LITERATURE: IMAGING ELLIPSOMETRY ON GRAPHENE

Graphene consists of sp^2-hybridized atomic carbon crystal. Graphene samples are usually fabricated by micro-mechanical cleavage of graphite following the work of Novoselov and coworkers (Noble price 2010). It has become of increasing interest because of depicted unique physical properties and promising applications. Although graphene is produced nearly every time a pencil is used, it is extremely difficult to find small graphene crystallites among millions of thicker graphitic flakes.

The paper reports imaging ellipsometry studies of graphene on SiO_2/Si and crystalline GaAs. Variable angle spectroscopic ellipsometry is used to explore the dispersion of the optical constants of graphene in the visible range. Also Delta and Psi maps with high lateral resolution of 1 µm were reported.

Wurstbauer U, Röling C, Wurstbauer U, Wegscheider W, Vaupel M, Thiesen PH, and Weiss D (2010) Imaging ellipsometry of graphene. Appl. Phys. Lett. 97, 231901 (Research Highlight)



- Images of the month: A biofilm on a Si substrate – ellipsometric contrast micrograph.

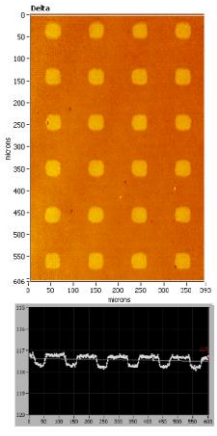
NEW SERIES: THESES ON IMAGING ELLIPSOMETRY

With this new series we would like to highlight theses that are of high quality and based on imaging ellipsometry or Brewster angle microscopy.

"Structure and Function of Switchable Surfaces" from David Peng, University of Michigan Ann Arbor, is the first. The aim of the dissertation is to expand understanding of the unique characteristics of switchable low-density SAMs. The developments may ultimately lead to next-generation technologies such as diagnostic sensors for non-invasive detection of disease markers and dynamic substrates for cell growth and tissue development.

In the comprehensive concept of characterization based (for example) on infrared spectroscopy, electrochemical impedance spectroscopy, and X-ray photoelectron spectroscopy, imaging ellipsometry was used for the determination of delta and thickness maps on patterned samples including low and high density areas. The measurements were performed at different temperatures and, in this case, used as surface plasmon resonance analysis to follow the intercalation of stearic acid, palmitic acid, and octadecyl rhodamine into low-density SAMs.

Peng D.(2010) Structure and function of switchable surfaces. Diss., Univ. Michigan, Ann Arbor, US



- Imaging ellipsometry delta maps and delta profiles of micropatterned SAMs (C16) after 5 h exposure to elevated temperature (373 K) [Peng D, 2010]..

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