DS 18 Optische Spektroskopie dünner Schichten I

Zeit: Montag 15:15–16:45 Raum: TU H110

DS 18.1 Mo 15:15 TU H110

Infrared ellipsometric study of electrochemically grafted organic layers on TiO_2 and Si — •Katy Roodenko[1], Michael Gensch[1], Jörg Rappich[2], Ullrich Schade[3], Ralf Hunger[4], Thomas Dittrich[5], Alexandra Merson[6], Yoram Shapira[6], Norbert Esser[1], and Karsten Hinrichs[1] — [1]ISAS - Department Berlin, Albert-Einstein-Str. 9, 12489 Berlin — [2]HMI, Abteilung SE1, Kekulestr. 5, 12489 Berlin — [3]BESSY, Albert-Einstein Str.15, 12489 Berlin — [4]Institute of Material Science, TU Darmstadt, Petersenstr.63, 64287 Darmstadt — [5]HMI, Abteilung SE2, Glienicker Str. 100, 14109 Berlin — [6]Department of Physical-Electronics, Faculty of Engineering, Tel-Aviv University, 69978 Tel-Aviv, Israel

Infrared spectroscopic ellipsometry (IR-SE) has been applied for the characterization of electrochemically grafted thin nitrobenzene layers on TiO_2 and Si. An optical layer model was used for the interpretation of ellipsometric spectra. This allowed a determination of the high frequency refractive index, molecular orientation and the thickness of the grafted films on the TiO_2. The earlier derived optical constants for ultra thin nitrobenzene films less than 2nm on Si(001) [1] were used as an input data in these calculations. The results were confirmed by additional methods, such as VIS-ellipsometry and X-ray photoemission spectroscopy (XPS). [1] M. Gensch et al, The use of infrared spectroscopic ellipsometry for studying ultra thin organic layers: nitrobenzene on Si(001), submitted for publication

DS 18.2 Mo 15:30 TU H110

Ultra-violet ellipsometry of ultra thin organic layers — •Ovidiu D. Gordan[1], C. Himcinschi[1], M. Friedrich[1], C. Cobet[2], N. Esser[2], W. Braun[3], and D. R. T. Zahn[1] — [1]Institut für Physik, TU Chemnitz, 09107 Chemnitz, Germany — [2]ISAS, 12489 Berlin, Germany — [3]BESSY GmbH, 12489 Berlin, Germany

Ultra-thin films of tris-(8-hydroxyquinoline)-aluminum(III) (Alq_3) were prepared by organic molecular beam deposition (OMBD) on hydrogen passivated silicon substrates in ultra high vacuum (UHV). In situ ellipsometric measurements were performed at a fixed angle of incidence (68°) in the spectral range from 4 to 9.5 eV using synchrotron radiation at BESSY II. For the first time we proved that the dielectric function can be reliably obtained in this range for strong absorbing materials even for sub-monolayer coverage. The results obtained via a complex fitting procedure are compared with direct calculation [1] using the experimental spectra. The absorption bands of a Alq_3 sub-monolayer coverage are shifted to higher energies compared to the bulk features. In addition, the shape of the extinction coefficient is in very good agreement with calculations employing time-dependent density functional theory.

[1] D. Aspnes-Spectroscopic Ellipsometry of Solids, Chap 15, Optical Properties of Solids New Developments, ed B.Seraphin, North Holland 1976

DS 18.3 Mo 15:45 TU H110

The crucial role of surface roughness in SEIRA and SERS — •Annemarie Pucci[1], Andreas Priebe[1], Matthias Lust[1], Gerhard Fahsold[1], and Andreas Otto[2] — [1]Kirchhoff-Institut fuer Physik, Universitaet Heidelberg, Im Neuenheimer Feld 227, D-69120 Heidelberg, Germany — [2]Institut fuer Physik der kondensierten Materie, Universitaet Duesseldorf, Universitaetsstr. 1, D-40225 Duesseldorf, Germany

On atomically rough metal surfaces selection rules for infrared (IR) absorption and for Raman scattering break down; additional vibration lines with increased oscillator strength may appear. Depending on the adsorbate species, the additional lines correspond to molecules with modified bonding (e.g. C2H4 on Cu) or to new chemical species (e.g. N2O and N2 from NO on Cu). Concerning the detection of the new species, surface enhanced IR absorption (SEIRA) and surface enhanced Raman scattering (SERS) show a very different sensitivity, which may be due to the basic differences in the excitation processes of the two methods. Molecules with excited states well above the Fermi energy do not show spectral changes due to the surface roughness.

DS 18.4 Mo 16:00 TU H110

Raman investigations of metal contacts on organic thin films: reactivity, indiffusion, and metal morphology — •G. Salvan, B. A. Paez, L. Mancera, R. Scholz, and D.R.T. Zahn — Institut für Physik, Technische Universität Chemnitz, D-09107 Chemnitz, Deutschland

Metallic contacts are essential constituents in novel devices based on organic semiconductors. Here, in situ Raman scattering by internal and external vibrational modes in crystalline organic semiconductor layers is employed to assess issues like chemistry, indiffusion, and metal morphology at the metal/organic interfaces. As model systems two perylene derivatives, 3,4,9,10-perylene-tetracarboxylic dianhydride (PTCDA) and N,N'-dimethyl 3,4,9,10-perylene-tetracarboxylic diimide (DiMe-PTCDI) were investigated. Ag, In, and Mg were deposited onto organic layers grown on passivated GaAs(100). The results reveal that Ag and Mg form abrupt interfaces while In strongly diffuses into the organic layers. For Mg, however, the strong differences observed in the lineshape of the Raman bands compared to those induced by Ag and In indicate a reactive nature of the Mg/PTCDA interface. Mg films also exhibit the lowest degree of roughness.

DS 18.5 Mo 16:15 TU H110

Raman spectroscopy of embedded semiconductor monolayers: CdSe in BeTe and ZnSe — •U. Bass[1], S. Mahapatra[1], T. Muck[2], V. Wagner[2], K. Brunner[1], and J. Geurts[1] — [1]Physikalisches Institut der Universität Würzburg, EP III, Am Hubland, D-97074 Würzburg — [2]International University Bremen, School of Engineering and Science, Campus Ring 8, D-28759 Bremen

Utilizing resonant excitation, Raman spectroscopy allows the analysis of single monolayers. In this way, resonant Raman spectroscopy gives access to surface layers as well as embedded monolayers. We apply this technique for II-VI semiconductor heterostructures: CdSe monolayers embedded either in BeTe or in ZnSe. When comparing these systems, we observe significant differences in interface abruptness, localization behavior of the monolayer vibration modes, and band structure alignment of ML and barrier material. Best interface abruptness and mode localisation occurs for CdSe/BeTe, while CdSe/ZnSe shows a considerable intermixing. Furthermore, the Raman spectra are distinctly influenced by details of the growth process, such as the atomic switching sequence at the interfaces and the temperature profile during growth. We correlate the Raman scattering efficiency with the photoluminescence spectra, originating from spatially direct transitions in CdSe/ZnSe, and from indirect ones in CdSe/BeTe.

DS 18.6 Mo 16:30 TU H110

In-situ Untersuchungen von Wachstumsparametereinflüssen auf die MOVPE von GaN — •H. Hardtdegen[1], R. Steins[1], N. Kaluza[1], Z. Sofer[1], Y.S. Cho[1], M. Zorn[2], K. Haberland[3] und J.-T. Zettler[3] — [1]Institut für Schichten und Grenzflächen, Center of Nanoelectronic Systems for Information Technology (CNI), Forschungszentrum Jülich GmbH, 52425 Jülich — [2]Ferdinand-Braun-Institut für Höchstfrequenztechnik, Gustav-Kirchhoff-Str. 4, 12489 Berlin — [3]LayTec Gesellschaft für in-situ und Nanosensorik mbH, Helmholtzstr. 13-14, 10587 Berlin

Die in-situ Reflektometrie ist eine etablierte Methode, um die Morphologieentwicklung und den Einfluss der Wachstumsparameter bei der Epitaxie von Gruppe III-Nitriden zu beobachten. Seit kurzem ist es zusätzlich möglich, die absolute Oberflächentemperatur transparenter Substrate mittels emissivitätskorrigierter Pyrometrie zu bestimmen. Die Temperaturabhängigkeit der SiC Bandlücke wird dabei zur Kalibrierung eingesetzt. In diesem Beitrag wird die neue Methode vorgestellt, der nunmehr beobachtbare Einfluss der Wachstumsparameter auf die absolute Oberflächentemperatur bestimmt, sowie die Auswirkungen auf die Epitaxie diskutiert.