DS 23: Symposium: In situ Optics III

Time: Thursday 10:00–11:00 Location: H34

DS 23.1 Thu 10:00 H34

Optical and electronic properties of the interface between small organic ring molecules and GaAs(001) surfaces — •T. Bruhn[1], R. Passmann[1,2], M. Kropp[1], W. Braun[3], M. Kneissl[1], W. Richter[1,4], N. Esser[1,2], and P. Vogt[1] — [1]TU Berlin, Institute of Solid State Physics, Hardenbergstr. 36, 10623 Berlin, Germany — [2]ISAS Berlin, Albert-Einstein-Str. 9, 12489 Berlin, Germany — [3]BESSY GmbH, Albert-Einstein-Str. 15, 12489 Berlin, Germany — [4]Universita Tor Vergata, Via della Ricerca Scientifica 1, 00133 Roma, Italy

Organic functionalization of semiconductor surfaces represents one of the most promising aspects in recent years. For a systematic installation of functional organic units in semiconductor devices, however, a detailed understanding of the interface formation is crucial. Due to the important role of III-V semiconductors in optoelectronics, we have investigated small ring molecules (cyclopentene (C5H8) and 1,4-cyclohexadiene (C6H8)) on different GaAs surface reconstructions. The samples were investigated with reflectance anisotropy spectroscopy (RAS), soft X-ray photo electron spectroscopy (SXPS) and scanning tunnelling microscopy (STM). For all reconstructions RAS measurements show that the adsorption of the molecules significantly changes the spectral line shape where surface related transitions of the clean surfaces contribute. Also a clear influence on the linear electro-optical effect (LEO) was observed. Additional molecular components were identified in the valence band spectra. A bonding to the arsenic-atoms is supported by STM measurements and core-level spectroscopy.

DS 23.2 Thu 10:15 H34

Infrared in-situ analysis of solid-liquid interface of a mixed polymer brush — •Y. Mikhaylova[1], L. Ionov[2], M. Gensch[1], N. Esser[1], J. Rappich[3], M. Stamm[2], S. Minko[4], K.-J. Eichhorn[2], and K. Hinrichs[1] — [1]ISAS - Institute for Analytical Sciences, Department Berlin, Albert-Einstein-Str. 9, 12489 Berlin — [2]Leibniz-Institut für Polymerforschung Dresden e.V., Hohe Str. 6, 01069 Dresden — [3]Hahn-Meitner-Institut Berlin GmbH, Abt. Silizium-Photovoltaik, Kekuléstr. 5, 12489 Berlin — [4]Chemistry Department, Clarkson University, Potsdam, New York 13699, USA

Mixed polymer brushes [1,2] find applications for control of wetability and adhesion because surface properties can be changed by external stimuli (pH, solvent, light, electric field). A mixed poly(2-vinylpyridine)-poly(acrylic acid) polymer grafted layer (mixed P2VP-PAA brush) with 50/50 composition was prepared via two subsequent "grafting to" reactions. The film was characterized in-situ by polarization dependent infrared (IR) spectroscopic measurements in single reflection geometry. During those measurements the brush was exposed to different solutions at varying pH, where conformational rearrangements in the brush and an inversion of the charge of the film occur. The reversible switching of the brush was analyzed in-situ via the component specific vibrational bands of P2VP and PAA. The polarization dependent spectra are interpreted quantitatively by optical simulation procedure. [1] S. Minko, D. Usov, E. Goreshnik, M. Stamm, Macromo. Rapid Commun. 2001, 22, 206; [2] L. Ionov, A. Sidorenko, K.-J. Eichhorn, M. Stamm, S. Minko, K. Hinrichs, Langmuir 2005, 21, 8711

DS 23.3 Thu 10:30 H34

Vibrational sum frequency spectroscopy studies of poly(lactic acid) films — •magnus johnson[1], albert sugiharto[1], marc smits[2], johannes nijsen[3], and sylvie roke[1] — [1]Max-Planck Institute for Metals Research, Stuttgart, Germany — [2]FOM-Institute AMOLF, Amsterdam, The Netherlands — [3]Department of Nuclear Medicine, University Hospital, Utrecht, The Netherlands

In the search for biodegradable polymers with versatile applications, poly lactic acid (PLA) has proven to be a fruitful option. This polymer has successfully been used in the treatment of liver cancer [1] and in the repair of blood vessels, for example. [2]

In order to increase the knowledge of the complex bulk and surface structures of PLA, vibrational sum frequency spectroscopy (VSFS) has been employed on PLA films with varying crystallinity and stereo regularity. The structure of the films can be determined by mapping both the well understood stretching modes of the methyl groups as well as the skeletal modes that have vibrational energies far down into the fingerprint region. From these studies we are able to obtain a detailed image of the interface and the bulk, and experiments performed with different polarizations of the laser beams have enabled a deeper understanding of the orientation of various functional groups of the polymer. Additionally, we are able to track the changes in crystallinity in the films, initiated by annealing.

[1] Zielhuis, S.W. et. al. Biomaterials, 26, 925 (2005) [2] Postema, A.R.; Pennings, A.J. J. Appl. Polym. Sci., 37, 2351 (1989)

DS 23.4 Thu 10:45 H34

In-situ Spectroscopic Ellipsometry studies of MOVPE grown new materials: InN and InGaN — •Martin Leyer[1], Massimo Drago[1], Markus Pristovsek[1], Wolfgang Richter[2], and Michael Kneissl[1] — [1]Technische Universität Berlin, Institut für Festkörperphysik, Hardenbergstr. 36, Germany — [2]Univ. di Roma "Tor Vergata", Dip. di Fisica, Via Ricerca Scientifica 1, 00133 Italy

Indium rich nitride semiconductors are especially challenging to grow, resulting in yet unresolved discussions on some of their basic properties, i.e. the fundamental bandgap energy. Our investigations have shown that spectroscopic ellipsometry is a very powerful tool for in-situ growth analysis of InN and related alloys. We have characterized in-situ several MOVPE grown InN layers of varying structural qualities in the energy range between 1,6 eV and 6,5 eV prior to contamination due to exposure to air. In this work we present a model for the dielectric function of InN. Analysis of the shift of the critical points of InN with the temperature allowed the determination of the temperature dependence of the InN optical properties between 300 K and 900 K. Such model could be used quantitatively to determine in-situ the InN growth rate as well as to determine surface effects such as roughening and accumulation of metallic Indium on the surface of the growing layer. The now known optical properties of the binary systems InN and GaN are used to approximate InGaN layers. Since we have found that ellipsometry is extremely sensitive to the formation of metallic Indium surfaces we are also investigating Indium segregation in InGaN quantum wells.