DS 20 Schichtwachstum

Zeit: Dienstag 15:15–16:30 Raum: TU H107

DS 20.1 Di 15:15 TU H107

Wachstum von selbstorganisierten nanoskaligen Kohlenstoff-Metall-Multilagen — •H. Zutz, I. Gerhards, H. Stillrich, C. Ronning und H. Hofsäss — II. Physikalisches Institut, Universität Göttingen, Friedrich-Hund-Platz 1, D-37077 Göttingen

Schichten aus amorphem Kohlenstoff und Metallen wurden mittels niederenergetischer massenselektierter Ionenstrahldeposition und mittels Magnetron-Sputtern hergestellt. Bei der Co-Deposition des Kohlenstoffes und der verschiedenen Metalle bildet sich eine Multilagenstruktur mit einer Periodizität von einigen nm aus, welche durch Selbstorganisationseffekte getrieben wird. Die metallreichen Lagen bestehen aus metallischen Nanokristallen. Experimente zeigen beispielsweise die Multilagenbildung bei der Co-Deposition von Kohlenstoff und Gold und Kohlenstoff und Eisen. Der Schwerpunkt der Untersuchungen lag bei den Eisen-Kohlenstoff-Multilagen, wobei mittels TEM die Periodizität bestimmt wurde und mit Mössbauerspektroskopie die Eisen-Carbid-Phasen untersucht wurden. Schließlich werden die Effekte, die zur Selbstorganisation der Multilagen führen, in diesem Vortrag diskutiert.

DS 20.2 Di 15:30 TU H107

Pattern formation in quasi-three-dimensional thin film growth simulations — •Frank Elsholz[1], Eckehard Schöll[1], Hans Eichler[2], and Chris Scharfenorth[2] — [1]Institut für Theoretische Physik, Technische Universität Berlin, Hardenbergstrasse 36, D–10623 Berlin — [2]Optisches Institut, Technische Universität Berlin, Hardenbergstrasse 36, D–10623 Berlin

Growth of thin dielectric films on glass substrates is investigated by means of a quasi-three-dimensional solid-on-solid growth model, which is solved by kinetic Monte-Carlo simulations. While growth of the first layer on a crystalline substrate in epitaxy can by investigated within a two-dimensional growth model without voids or overhangs, thin films with a thickness of several monolayers has to account for vertical diffusion also. We propose a new quasi-three-dimensional model which allows for simulating growth of several hundreds of nanometer film thickness at considerable simulation system size of 200×200 nm^2 even at lower available computer memory resources. Theoretical and experimental results are compared to each other, discovering three stages of thin film growth.

DS 20.3 Di 15:45 TU H107

Growth kinetics of InGaAsN quantum wells analysed by transmission electron microscopy — •Martin Albrecht[1], Ines Häsuler[1], Thilo Remmle[1], Lutz Geelhaar[2], and Henning Riechert[2] — [1]Institut für Kristalzüchtung, Max-Born-Strasse 2, 12489 Berlin — [2]Infineon Coporate Research Photonics, Otto-Hahn-Ring 6, 81730 München

Growth kinetics essentially influences the structural and thus optical properties of quantum wells based on InGaAsN. Although it is well known that InGaAsN undergoes a transition from 2D- to 3D growth with increasing growth temperature and increasing N-concentration a detailed study on the influence of N on the growth ofvthis pseudo ternary alloy is missing. In this contribution we present experimental work based on high resolution transmission electron microscopy. InGaAs, GaAsN and InGaAsN samples are grown by radio frequency plasma source molecular beam epitaxy in the temperature range between 400°C-450°C. We study the transition from 2D growth to 3D growth as dependent on temperature, layer thickness and growth rate. Our results clearly show that it is the interaction of In and N that causes 3D growth. Energy filtered transmission electron microscopy reveals that N-incorporation decreases with increasing In-content. In case of 3D-growth a reduced In-concentration is found in the wetting layer. We discuss our experimental findings in terms of In-segregation facilitated by N.

DS 20.4 Di 16:00 TU H107

Cu/MgO(001)studied with IR spectroscopy and AFM — •Fanzhen Meng, Andreas Priebe, Matthias Lust, Dominik Enders, Gerhard Fahsold, and Annemarie Pucci — Kirchhoff-Institut für Physik,Universität Heidelberg

In this work we consider metal films of Cu which are grown on MgO(001) at room temperature and with similar deposition rate (about 0.1 nm/min) in a UHV chamber. The Cu films were grown under CO exposure (pressure is about $4*10^{-8}$ mbar) during the whole film growth or only in the beginning of film growth. CO exposure at different phases of the whole film growth process has different effects on film morphologies. We study these films with in-situ IR-transmittance spectroscopy during film growth. We also calculated IR spectra with a Drude-type model and with an effective medium model.

Adsorbates on metal island films can show surface enhanced infrared absorption (SEIRA). The Cu films were cooled down to 100 K for CO exposure and in-situ the IR transmittance was measured.

AFM pictures were taken after transfering of the films into air. The AFM pictures correspond to our findings on film morphology from IR transmission spectra of the metal film and from SEIRA.

DS 20.5 Di 16:15 TU H107

Effects of deposition on Cu-induced surface nanostructures on VSe_2 layered crystals — •F. Dietz[1], E. Spiecker[1], S. Hollensteiner[1], W. Jäger[1], H. Haselier[2], and H. Schroeder[2] — [1]Technische Fakulät der Christian-Albrechts-Universität zu Kiel — [2]Forschungszentrum Jülich

The present study aims at the investigation of nanostrucuture networks which form upon Cu deposition on VSe_2 surfaces [1] as templates for the formation of nanowires. The nanostructures were created applying UHV electron beam evaporation of Cu ($\leq$ 2 nm) onto freshly cleaved (0001)-oriented VSe_2 crystals at ambient temperature and at 200°C. Subsequently Au with nominal coverage up to 2.5 nm was deposited at identical temperature. Light microscopy, scanning electron microscopy, and transmission electron microscopy investigations have been combined to characterize the effects of Au deposition following nanostrucuture formation. Au deposition at ambient temperature leads to formation of 2-dimensional islands within the network meshes forming an interconnected film at increased coverage. Detailed electron diffraction analyses show that the film corresponds to $<111>$ textured fcc Au with an (220)Au$\|$ ($\bar{1}\bar{1}$20)VSe_2 orientation relationship. Along the nanostructures decoration with large Au clusters occurs. At deposition temperature of 200°C the decoration is even more pronounced leading to linear arrays of Au clusters.

[1] Spiecker et al., Microsc. Microanal. (2004), accepted.