O 94: Methods: Other Experimental Techniques II

Time: Friday 12:00–13:15 Location: MA 141

O 94.1 Fri 12:00 MA 141

***In situ* Präparation von kristallographisch orientierten Spitzen in der Rasterkraftmikroskopie** — •Thorsten Wutscher, Sebastian Gritschneder und Franz J. Giessibl — Universität Regensburg, Institut für Experimentelle und Angewandte Physik, 93 040 Regensburg

Die atomare Konfiguration und die chemische Identität der Spitze eines Kraftmikroskops ist von zentraler Bedeutung für die Abstands- und Winkelabhängigkeit der Kraft zwischen Spitze und Probe [1, 2]. Bisher wurden die Spitzen mittels eines elektrischen Feldes, einer Kollision mit der Probenoberfläche oder durch Ionenbeschuss präpariert. Hier wird versucht *in situ* eine saubere und kristallographisch wohldefinierte Spitze aus leicht spaltbaren Materialien herzustellen. Für Nickeloxid, ein Material mit Kochsalzstruktur, wurden drei unterschiedliche Spaltgeometrien entwickelt. Die mit einer Wafersäge bearbeiteten Nickeloxidstücke werden als Balken und Würfel auf einem stabilen Quarzfederbalken (qPlus Sensor) kristallographisch orientiert fixiert. Eine auf gesägte Sollbruchstellen wirkende Kraft leitet das Spalten in einer oder mehrerer Ebenen ein. Die Eignung der dadurch entstehenden Spitzen für hochauflösende Kraftmikroskopie wird durch erste Resultate atomarer Auflösung auf NiO (0 0 1) demonstriert.

[1] Yoshiaki Sugimoto, Pablo Pou, Masayuki Abe, Pavel Jelinek, Rubén Pérez, Seizo Morita and Óscar Custance, Nature, Vol. 446, 64 - 67 (2007)

[2] Stefan Hembacher, Franz J. Giessibl, Jochen Mannhart, Science, Vol. 305, 380 - 383 (2004)

O 94.2 Fri 12:15 MA 141

Scanning of the near-field thermal heat transfer — •Robert Berganski, Uli Wischnath, and Achim Kittel — Energy and Semiconductor Research Laboratory - University of Oldenburg

The heat transfer is measured by means of a scanning near-field thermal microscope based on a commercial scanning tunnelling microscope (STM). Hereby a miniaturized coaxial thermocouple is kept at a constant distance above the surface by using the constant current mode of the STM while the change of the temperature at the tip is recorded. Thereby the heat transfer and the sample topography are measured at the same time and, thus, the heat transfer can be correlated to the surface morphology. The investigated heat transfer relies on evanescent modes of the thermal transfer between the tip at room temperature and the sample at about 110K. All other interfering heat transfer mechanisms are excluded by using ultra high vacuum conditions. In the present contribution the focus lies on the material dependence of these evanescent modes which are reaching a few nano-meter into the vacuum. By varying the material of the sample surface the influence of the dielectric properties of the material and the morphology of the surface are studied.

O 94.3 Fri 12:30 MA 141

The mono-cantilever method of performing multi-contact measurements of surface conductivity — •Justin Wells[1], Karsten Hardrup[1], Fei Song[1,2], Jesper Kallehauge[1], Lauge Gammelgaard[3], Shi ning Bao[2], and Philip Hofmann[1] — [1]ISA and iNano, University of Aarhus, 8000 Aarhus C, Denmark — [2]Department of Physics, Zhejiang University, P.R. China — [3]MIC, Technical University of Denmark, 2800 Kgs. Lyngby, Denmark

Despite the paramount importance of conductance measurements to bulk solid state physics, surface conductance is very poorly understood. A prominent example for the sorry state of the field is the Si(111)(7 × 7) reconstruction. Several claims to measure the surface conductance have been made but these span 5 orders of magnitude.

In this work, we present a multi-contact mono-cantilever probe, which differs from earlier monolithic 4-point probes by that fact that all contacts are mounted on a single cantilever. In this approach, the minimum spacing can be reduced to the order of 250 nm, whilst keeping the cantilever size in the micrometer range (and thus it is strong and easily visible).

As an example, we will present measurements made on Bi(111). In contrast to the semimetallic bulk, this surfaces support metallic surface states, forming a quasi two-dimensional metal. Using measurements with different probe spacings, we are able to estimate an upper limit of the conductance through these surface states.

O 94.4 Fri 12:45 MA 141

XRR investigations of II-VI and III-nitrid based DBR-structures, multilayers and superlattices. — •Radowan Hildebrand, Thomas Schmidt, Ardalan Zargham, Moritz Speckmann, Carsten Kruse, Detlef Hommel, and Jens Falta — Institute of Solid State Physics, University of Bremen, Germany

Thin layers, especially distributed bragg reflectors (DBR), are important components in vertical cavity surface emitting laser (VCSEL)-structures. The investigation of AlN/InGaN and MgS/ZnCdSe DBR structures with the method of x-ray reflection (XRR) enables the determination of electron density, multilayer thickness and roughness of the interfaces. Reducing the roughness is of peculiar interest to achieve high reflective DBRs.

O 94.5 Fri 13:00 MA 141

Stereographic intensity maps of elastically backscattered electrons in directional elastic peak electron spectroscopy — •Irek Morawski and Marek Nowicki — Institute of Experimental Physics, University of Wrocław, pl. M. Borna 9, PL 50-204 Wrocław, Poland

The full hemispherical intensities of elastically backscattered electrons from Au(111) were measured using directional elastic peak electron spectroscopy (DEPES) [1] at primary electron beam energies in the range from 0.5 till 2.0 keV. The enhancement of recorded intensities is observed when the primary electrons strike the crystalline sample along the close packed rows of atoms. Experimental stereographic intensity maps reveal a three-fold symmetry of the substrate, which gives straightforward identification of the sample crystalline structure. Theoretical intensity distributions were obtained using multiple scattering (MS) calculations [2]. In calculations different scattering orders were taken into account. An R-factor analysis of experimental and theoretical patterns reveals a significant role of the higher scattering order leading to the defocusing effect along the closest-packed rows of atoms. A contribution of particular sample layers to the recorded signal as well as application of the total electron mean free path instead of so far used values of the inelastic mean free path in calculated MS intensities are discussed.

[1] S. Mróz, M. Nowicki, Surf. Sci. 297 (1993) 66.

[2] I. Morawski, M. Nowicki, Phys. Rev. B 75 (2007) 155412