O 52: New Methods: Experiment

Time: Tuesday 18:00–20:00 Location: P2

O 52.1 Tue 18:00 P2

Exploring novel scanning force microscopy schemes by stabilising unstable states — •Lukas Böttcher[1], Hannes Wallner[2], Niklas Kruse[2], Wolfram Just[2], Ingo Barke[1], Jens Starke[2], and Sylvia Speller[1] — [1]Universität Rostock, Institute of Physics — [2]Universität Rostock, Institute of Mathematics

Dynamic scanning Force Microscopy (SFM) is a versatile and popular method for investigation of surface properties on the nanoscale. When probing the surface with an oscillating cantilever bistabilities may occur [1, 2], which are a result of nonlinearities arising due to interaction between tip and sample. By implementing a control scheme, we track the unstable state arising between the two stable states [3]. These unstable states may enable ultra-sensitive imaging conditions and give access to virtually interaction free mapping of material parameters.

[1] Gleyzes, P., Kuo, P.K., Boccara, A.: Bistable behavior of a vibrating tip near a solid surface. Appl. Phys. Lett. 58, 2989 (1991) [2] Misra, S., Dankowicz, H., Paul, M.: Event-driven feedback tracking and control483 of tapping-mode atomic force microscopy. Royal Society of London Proceedings484 Series A 464, 2113*2133 (2008) [3] Böttcher et.al, Exposing hidden orbits in scanning force microscopy, in preparation

O 52.2 Tue 18:00 P2

Surface photovoltage spectroscopy for investigation of SiC surface quality — •Viktoriia Nikonova[1], Nadine Schüler[1], Steffen Fengler[1], Maaz Soomro[1], Knut Gottfried[2], Imme Ellebrecht[2], and Kay Dornich[1] — [1]Freiberg Instruments GmbH, Delfter Strasse 6, 09599, Freiberg, Germany — [2]ErzM-Technologies UG, Technologie-Campus 1, 09126, Chemnitz, Germany

The surface photovoltage (SPV) technique belongs to the advanced methods for studying charge separation and transfer processes in photoactive materials.

The measurements of the SPV signal amplitude and time constant maps for SiC wafers have been done using a compact HR-SPS tool with fixed energy excitation sources. It has a high flexibility, which for example enables the integration of up to four lasers in the measurement head, either for injection level dependent SPV measurements or extracting depth information by using different wavelengths. Presented method based on fixed capacitor approach, that is much faster and more sensitive than on Kelvin probe. Also it works for highly doped substrate for which microwave based methods are difficult.

The experiments show the difference in maps between surface quality of wafers: polished wafers, fine and coarse grinded surfaces. Thus, the presented technique can be used to make quantitatively based decisions on the goodness of surface treatment methods without damaging the samples and to improve production based on SiC and others wide bandgap materials.

O 52.3 Tue 18:00 P2

ESEM Automation - Advanced Acquisition & Dual Magnification — •Maurits Vuijk[1], Annika Kubsch[1], Johannes Zeininger[2], Karsten Reuter[1], Thomas Lunkenbein[1], and Christoph Scheurer[1] — [1]Fritz-Haber-Institut der MPG, Berlin — [2]TU Wien

In Environmental Scanning Electron Microscopy (ESEM) experiments, the acquisition parameters are generally kept constant throughout the collection of the data set. This requires human supervision and limits data collection to one data set at a time. We use a custom automation interface to minimize supervision and allow for the collection of multiple simultaneous data sets containing complementary information.

Slow oscillatory dynamics are observed on a Co surface under hydrogen and oxygen dosing conditions using traditional ESEM. With our automation interface, we can implement more advanced acquisition programs into the microscope that take advantage of different time scales of the surface dynamics. By using automation to change the settings of the acquisition after each frame, we are able to capture multiple interlaced views of the same process. In this case, we alternated between two different magnification values, allowing us to capture a low magnification overview of the propagation of the surface dynamics and a high magnification view of the ongoing local structural changes to a selected surface feature. Many acquisition parameters such as gun voltage, stage position or focus can be automatically adjusted in an intelligent fashion, allowing for more complex acquisition strategies to unravel complex dynamic processes.

O 52.4 Tue 18:00 P2

Simultaneous Grazing Incidence Small Angle X-Ray Scattering (GISAXS) and Absorption Spectroscopy (XAS) of Liquid Surfaces — •Carlo Schneider, Lukas Voss, Frederic Braun, and Dirk Lützenkirchen-Hecht — Bergische Universität Wuppertal

A method combining Grazing Incidence Small Angle X-ray Scattering (GISAXS) and X-ray Absorption Spectroscopy (XAS) has been developed to investigate liquid surfaces. The approach employs a specialized reaction cell and detection systems, including a PILATUS 100k detector for scattering data and a PIPS detector for absorption spectra, paired with a Quick EXAFS (QEXAFS) monochromator. Solutions of nickel chloride, cobalt nitrate, and zinc acetate were analyzed to evaluate the feasibility of integrating time-resolved GISAXS with XAS. Results demonstrate the capability of the method to provide structural and compositional information on nanometer and angstrom scales simultaneously. Challenges, such as interference patterns potentially caused by instrumental effects, were identified and suggest areas for further refinement. The developed technique offers potential for applications in materials science and chemistry, enabling insights into liquid systems.

O 52.5 Tue 18:00 P2

Surface-Sensitive Analysis of Liquid Interfaces: Grazing Incidence X-Ray Absorption Spectroscopy with a Double-Mirror Setup — •Lukas Voss, Dirk Lützenkirchen-Hecht, Frederic Braun, and Carlo Schneider — Bergische Universität Wuppertal, NRW

Grazing incidence X-ray absorption spectroscopy (GIXAS) is a powerful technique for surface-sensitive investigations. While the study of solid materials can be easily performed by adjusting the sample orientation to vary the X-ray incidence angle, the examination of liquids requires a specialized experimental setup. To address this challenge, a double-mirror system was integrated into an existing reflectometer, enabling GIXAS measurements on liquid samples. This setup was utilized to study the melting behavior of gallium and the formation of sol-gel-derived germanium oxide nanoparticles.