O 35: Poster Session I (Scanning probe methods)

Time: Tuesday 18:30–22:00 Location: P3

O 35.1 Tue 18:30 P3

Measurement of the interactions between two molecules with NC-AFM — •Martina Corso, Christian Lotze, and Jose Ignacio Pascual — Institut für Experimentalphysik, Freie Universität Berlin, Arnimallee 14, 14195 Berlin, Germany

Non-contact atomic force microscopy (NC-AFM), operated in frequency modulation mode, has been recently the subject of extraordinary advances. One of its most striking achievement resides on its capability to resolve the chemical structure of molecules with unprecedented atomic resolution [1]. Such measurements are possible by detecting short-range bonding interactions between the foremost atom of a tip at the end of a cantilever and the atoms at the surface. In order to minimize contributions from van der Waals and electrostatic interactions, sharp STM tips are used. With our STM/AFM based in a qPlus sensor design operated at 5K we use CO modified STM tips to quantify the forces involved during imaging and manipulation of small (as CO) and large molecules (as DPBP) adsorbed on a Cu(111) surface. In particular we investigate with force spectroscopy site specific interactions between a CO-tip and C_2H_2 molecules. Short-range interaction force curves suggest that a local bond between two species might be formed. [1] L. Gross, F. Mohn, N. Moll, P. Liljeroth, G. Meyer, *Science* **325**, 1110 (2009).

O 35.2 Tue 18:30 P3

Electronic regulation in the etching process for STM-tips — •Volkmar Hess, Wolfgang Rosellen, and Mathias Getzlaff — Institute of Applied Physics,University Duesseldorf

The scanning tunneling microscope (STM) became one of the most important instruments for the surface science community because it enables the imaging with atomic resolution. The probe tip itself has crucial influence on the success of STM experiments. There are many routes to produce tips such as etching or cutting. In this contribution we report on the set up of an electronic circuit which should improve the quality and the reproducibility of etched tips. This should be archieved by immediate cut off the etching current after the tip dropped off. Former experiments showed a clear relation between cut-off time and tip radius. The functional properties of the electronic circuit were characterized by means of an analog-digital-converter. Furthermore, the influence of other parameters like etching potential and different etching solutions on the shape of tips were analyzed. Subsequently the tips were characterized with an optical microscope and a scanning electron microscope and compared to commercially offered tips.

O 35.3 Tue 18:30 P3

Developing a miniaturised device for in-situ STM tip cleaning using electron bombardment — •David Hellmann[1], Ludwig Worbes[1], and Achim Kittel[2] — [1]EHF, Fak. V, Physik, Carl von Ossietzky Universität Oldenburg — [2]Experimental Polymer Physics, Faculty of Mathematics and Physics, University of Freiburg, 79104 Freiburg

Most SPM techniques rely on the assumption that both sample and tip are free from adsorbates and other residues. Getting a clean sample surface can be readily accomplished by applying ion sputtering, whereas finding an adequate treatment for tips is much more complicated. In principle one wants to desorb any molecules which might interfere with the anticipated measurement. This must be achieved without reducing the sharpness or the general geometry of the tip. Several devices are described in the literature which employ accelerated electrons to do this [1]. When such a procedure is applied in a variable temperature SPM, one has to keep the duration of any treatment as short as possible to avoid thermal drifts. To achieve this, we constructed an electron source which can be put into the sample holder while the tip stays in place. In our case, a tiny thermocouple is incorporated at the foremost tipapex, designed to perform measurements of the heat flow between a cooled or heated sample and the tip [2]. By means of these tips a direct measurement of the tip temperature during electron sputtering is possible. Literature: [1] S. Ernst et al., Science and Technology of Advanced Materials 8 (2007) [2] U. F. Wischnath, J. Welker, M. Munzel, A. Kittel, Review of Scientific Instruments 79 (2008)

O 35.4 Tue 18:30 P3

A sub-Kelvin facility for cross-sectional scanning tunneling spectroscopy of metal-semiconductor heterostructures — •Peter Löptien, Focko Meier, Lihui Zhou, Jens Wiebe, and Roland Wiesendanger — Institute of Applied Physics, University of Hamburg, Germany

We investigate III-V semiconductors with magnetic dopants by spin-resolved scanning tunneling spectroscopy in order to achieve an atomic-scale understanding of magnetism in these systems [1, 2]. The method of choice for *ex-situ* grown heterostructures is cross-sectional scanning tunneling microscopy which enables to study their bulk properties by looking at nonpolar surfaces prepared by cleavage under ultra high vacuum conditions [3]. For these experiments we have planned and constructed a low-temperature scanning tunneling microscopy facility with the possibility to move the sample laterally. The main chamber being commercially available consists of a Joule-Thomson cryostat with a scanning tunneling microscope. It has a base temperature of less than 1 K using ^{4}He. There are two additional home built vacuum chambers for *in-situ* sample and tip preparation. These chambers include several electron beam evaporators, a customized sample heating manipulator, an electron beam heater and a sputter gun. The whole system is attached to a frame and supported by passive air damping legs. We will show first test measurements.

[1] F. Meier *et al.*, Science **320**, 82 (2008)
[2] A. A. Khajetoorians *et al.*, Nature **467**, 1084 (2010)
[3] M. Bertelli, P. Löptien *et al.*, Phys. Rev. B **80**, 115324 (2009)

O 35.5 Tue 18:30 P3

Design of a low-temperature scanning tunneling microscope with integrated lenses for in-situ optical access — •Jens Kügel, Paolo Sessi, and Matthias Bode — Institute of Experimental Physics II, University Würzburg, Am Hubland, 97074 Würzburg

While Scanning Tunneling Microscopy (STM) is a well-estabilised technique to gain information on surfaces topography and density of states on the atomic scale, its time resolution ist still rather limited. Under open loop conditions, values down to the nanoseconds regime have been recently reported [1]. This limitation can be overcome by laser spectroscopy which offers a time resolution down to a few attoseconds [2]. Here we present a low-temperature STM design able to combine these two experimental techniques. Besides standard STM features such as tip coarse movement and sample-nanopositioning, it includes lense holders for focused back and front side laser illumination. Potential measurement modes aimed, e.g., for the spatio-temporal investigation of excited molecular states, will be discussed.

[1] S. Loth *et al.*, Science 329, 5999 (2010)
[2] M. Schultze *et al.*, Science 328, 1658 (2010)

O 35.6 Tue 18:30 P3

Combined scanning tunneling and atomic force microscopy at low temperatures — •Tobias Herden[1], Markus Ternes[1], and Klaus Kern[1,2] — [1]Max Planck Institute for Solid State Research, Heisenbergstrasse 1, 70569 Stuttgart, Germany — [2]Institut de Physique des Nanostructures, Ecole Polytechnique Fédérale de Lausanne, 1015 Lausanne, Switzerland

Quartz tuning forks have an interesting history in the evolution of scanning probe microscopy. Edwards et al. [1] were the first to use them with a tip glued to one prong as AFM sensor. In 1998 Giessibl [2] introduced a technique (qPlus) where the tuning fork is excited externally and a conducting tip is used allowing for simultaneous AFM and STM measurements. The capabilities of this design have been demonstrated by a broad variety of measurements: from quantitative forces measurements when an atom or molecule is moved over a surface [3] to sub-molecular resolution of pentacene by Gross et al. [4].

This type of sensor was implemented in a newly built STM head. It is designed to operate in UHV in a Joule-Thomson cryostat, at temperatures below 1 Kelvin and in magnetic fields up to 14 Tesla. The head was extensively tested at ambient conditions and in moderate vacuum and first measurements at low temperatures will be presented. The focus will be on the design, especially the mounting and contacting of the tuning fork.

[1] H. Edwards et. al, J. Appl. Phys. 82, 980 (1997) - [2] F. J. Giessibl, Appl. Phys. Lett. 73, 3956 (1998) - [3] M. Ternes et.al,

Science 319, 1066 (2008) - [4] L. Gross et. al, Science 325, 1110 (2009)

O 35.7 Tue 18:30 P3

Development of a nanoscale scanning-probe magnetometer with single spin sensitivity — •Eike Oliver Schäfer-Nolte[1,2], Friedemann Reinhard[2], Markus Ternes[1], Fedor Jelezko[2], Jörg Wrachtrup[2], and Klaus Kern[1] — [1]Max-Planck Institut für Festkörperforschung, Stuttgart, Germany — [2]3. Physikalisches Institut, Universität Stuttgart, Germany

The detection of weak magnetic fields at small length scales is a longstanding challenge in physics. We report on our work constructing a scanning-probe magnetometer capable to measure small magnetic fields and single spins with sub-nanometer spatial resolution.

This experiment employs a nitrogen-vacancy (NV) center in diamond as an ultrasensitive magnetic field sensor. Its spin state can be monitored using optically detected magnetic resonance [1]. Attaching a nanodiamond containing this "probe spin" to the tip of an atomic force microscope (AFM) working in ultra-high vacuum at low temperature allows studies of magnetic fields at the atomic scale [2,3]. The details of the experimental setup are presented along with experimental data characterizing the individual components.

[1] F. Jelezko et al., phys. stat. sol. (a) 203, No 13 (2006)
[2] G. Balasubramanian et al., nature Vol 455 (2008)
[3] J.M. Taylor et al., nature physics Vol 4 (2008)

O 35.8 Tue 18:30 P3

Electromigration on Ag-nanowires studied down to the atomic scale — •Mark Kaspers, Alexander Bernhart, Christian Bobisch, and Rolf Möller — Faculty of Physics, Center for Nanointegration Duisburg-Essen, University of Duisburg-Essen, Lotharstr. 1, 47048 Duisburg, Germany

Energy dissipation due to electronic stressing can result in diffusion of material at surfaces. If the biased motion of atoms is induced by a current flow (wind force) or an applied electric field (direct force) this is referred to as electromigration. We present *in situ* measurements of electromigration, potentiometry and topography of monocrystalline Ag-nanowires grown on vicinal Si(001) substrates. We use an UHV multiprobe scanning tunneling microscope (STM) including different scanning probe techniques and a scanning electron microscope (SEM). Two STM-tips of the multiprobe system are used to contact the nanowire. The positioning of the tips is monitored by SEM. This setup allows to control and monitor electromigration processes on the nanowire's surface down to the atomic scale by video SEM and STM, thus revealing the evolution of the surface morphology, i.e. step edge diffusion, during electrical stressing [1].

[1] M.R. Kaspers et al., J. Phys.: Condens. Matter **21**, 265601 (2009)

O 35.9 Tue 18:30 P3

Probing the thermal near-field of thin Fe-Layers on Au(111) by NSThM — •Ludwig Worbes[1], David Hellmann[1], and Achim Kittel[2] — [1]EHF, Fak. V, Physik, Carl von Ossietzky Universität Oldenburg, — [2]Experimental Polymer Physics, Faculty of Mathematics and Physics, University of Freiburg, 79104 Freiburg

The evaporation of a few monolayers of Fe on top of Au(111) surfaces is known to produce nano-meter sized Fe-islands which are found at specific locations of the herringbone surface-reconstruction.

We investigate the thermal near field of these surfaces by Near-field Scanning Thermal Microscopy (NSThM). The NSThM developed in our group is based on a STM, featuring a tunnelling probe with an integrated miniaturized thermocouple temperature sensor located about 500nm behind the tunnelling gap. Therefore, we can measure the temperature change of the tip due to heat flux between a heated or cooled sample and the probe at distances of a few nanometres, mediated by thermal near fields [1]. Thermal near-field (evanescent) modes, exponentially decaying with distance to the surface, surround every body with a finite temperature. They are generated by thermally fluctuating charges, analogously to the electromagnetic far field described by Stefan-Boltzman law.

In our experiments, we observe characteristic distributions of the heat flux by thermal near-fields. That is an enhanced heat transfer at the edges of the Fe-islands due to edge enhancement effects, already known in the realm of visible light optics.

[1] Achim Kittel et al., Appl. Phys. Lett. 93, 193109 (2008)

O 35.10 Tue 18:30 P3

A combined STM / FIM for tip specific tunnelling experiments — •Ben Wortmann and Rolf Möller — Faculty of Physics, Center for Nanointegration Duisburg-Essen, University of Duisburg-Essen, 47048 Duisburg, Germany

We present details on a homebuilt, compact, low temperature scanning tunnelling microscope that allows insitu field ion microscopy of a cooled tunnelling tip inside the STM. Therefore a characterization of the tip is possible without transfer to a different position in the UHV system. This guarantees that the tip characterized by FIM is identical to the one used for the STM experiment. The geometry of the microscope resembles a cylinder with a height of only 13 cm and a diameter of 4 cm. Shutters at the bottom of the microscope can be opened to expose the tip to a channel plate or closed to assure even lower temperatures and minimal thermal drift while tunnelling. A combination of two piezo-electric accentuators is used to move a magnetically attached unit (*slider*) by a slip-stick motion. The tip is spot welded to the slider which can be easily exchanged in vacuum. The STM is screwed directly onto a commercially available continuous flow cryostat which allows cooling to about 5-7 K. Insulation from vibration is provided by a combination of springs and eddy current damping. Sister systems already show the performance of the STM setup[1]. The very compact design minimises helium consumption to about 1 liter/hour. [1] (H. Karacuban, M. Lange, J. Schaffert, O. Weingart, Th. Wagner and R. Möller, Surf. Sci. Lett., 603, Issue 5, L39 (2009).

O 35.11 Tue 18:30 P3

Nanoscale mapping of ion dynamics in solid electrolytes by time and space resolved electrostatic force spectroscopy — •Marvin Stiefermann[1], Dirk Dietzel[1], Bernhard Roling[2], and Andre Schirmeisen[1] — [1]Institute of Physics and Center for Nanotechnology (CeNTech), University of Muenster, Germany — [2]Department of Chemistry, Philipps-University Marburg, Germany

For many technological applications, such as batteries or fuel cells, materials with good ionic transport parameters are of paramount importance. Recently, the search for improved ion conducting materials has lead to nanostructured materials, where the transport properties are often determined by interaction of different phases (e.g. crystalline and amorphous) and their interfaces. In this context an improved understanding of the local nanoscale transport properties is important to further optimize the performance of such ion-conducting materials. However, classical analysis techniques, such as conductivity spectroscopy, are not suitable to directly extract nanoscale information. In this contribution we will therefore demonstrate how ionic transport properties can be mapped by Atomic Force Microscopy based electrostatic force spectroscopy [1]. By systematic temperature dependent grid spectroscopy different ion relaxation channels can be identified and correlated with the structure of a Lithium ion conducting glass ceramics (LIC-GC by Ohara cooperation). Special attention is focused on the influence of grain boundaries, which are suspected to act as a bottleneck for the macroscopic ion conduction.

[1] Schirmeisen and Roling, Chemical Monthly 140, 1103 (2009)

O 35.12 Tue 18:30 P3

Nano scale mechanical characterization of surfaces — •Alexander Malwin Jakob and S.G. Mayr — Leibniz-Institut fuer Oberflaechenmodifizierung, Translationszentrum fuer Regenerative Medizin und Fakultaet fuer Physik und Geowissenschaften der Universitaet Leipzig, 04318 Leipzig

With proceeding miniaturization in science and technology, mechanical properties at the nano scale have attracted increased interest during the past years. Although commercial nano indenters are widely available at this point, they usually probe the micro scale rather than measuring nano-mechanical properties. For real nanometer resolved mechanical characterization, atomic force microscope (AFM) based techniques like contact resonance force microscopy (CR-FM) are highly promising, as first proposed by Rabe and Arnold [1] as well as Yamanaka [2]. While our first setup employed a hardware realization of this technique [3], the present contribution deals with a purely software based implementation of CR-FM into a commercial AFM. Capabilities and limitations for exemplary surfaces are presented. The experimental studies are supplemented by finite element modeling of the cantilever-sample interaction.

This project is funded by the German BMBF, PTJ-BIO, Grant Number: 0313909.

[1] Rabe U., Arnold W., Appl. Phys. Lett. Vol.64, P1493-1495 (1994)
[2] Yamanaka K., Ogiso H., Kolosov O., Appl. Phys. Lett., Vol.64, P178-180 (1994)
[3] C. Vree, Dissertation, Göttingen (2009)

O 35.13 Tue 18:30 P3

Local surface spectroscopy with STHM junction — •Georgy Kichin, Christian Weiss, Christian Wagner, Stefan Tautz, and Ruslan Temirov — Peter Grünberg Institut (PGI-3), Forschungszentrum Jülich and JARA-Fundamentals of Future Information Technology

Scanning tunneling hydrogen microscopy (STHM) is a new imaging regime in which a low temperature (5-10K) STM can be operated when $H_2(D_2)$ is adsorbed in the junction [1]. The imaging mechanism of the STHM has recently been identified: H_2 or D_2 confined between the tip and the surface plays a dual role of the sensor and transducer. The sensor samples interaction with the surface and translates this interaction into variations of the Pauli repulsion between the gas molecules and the tip. The transducer converts the changing Pauli repulsion into variations of the tip's density of states (DOS), which is finally recorded as laterally varying junction conductance [2,3]. In this contribution we study inelastic electron tunneling spectra of the STHM junction. The inelastic tunneling data suggest that the junction has a rich excitation spectrum. Moreover, characteristic energies of the observed excitations show a strong dependence on such parameters as the gas coverage, tip-surface distance and the local surface structure.

[1] R. Temirov et al. New J. Phys. 2008, 10, 053012 [2] C. Weiss et al. Phys. Rev. Lett. 2010, 105, 086103 [3] C. Weiss et al. J. Am. Chem. Soc. 2010, 132, 11865

O 35.14 Tue 18:30 P3

A low-noise STM equipped with a cryogenic transimpedance amplifier — •Martin Kunz and Jörg Kröger — Institut für Physik, Technische Universität Ilmenau, 98693 Ilmenau, Germany

We present the current status of a home-built scanning tunnelling microscope (STM) designed to be operated inside a helium cryostat at 4.2 K in an ultrahigh vacuum. The influence of electromagnetic interference on the tunnelling signal, which is a serious noise source in tunnelling experiments, is minimized by placing a transimpedance amplifier in close vicinity to the tunnelling probe. This custom-built amplifier has a bandwidth from DC to 100 kHz. It is thermally coupled to the cryostat and can be deployed at temperatures ranging from liquid helium to room temperature. In particular, at low temperatures the signal degradation due to Johnson noise is significantly smaller than in conventional STM setups that employ transimpedance amplifiers operated at room temperature. The microscope is primarily intended for spin-resolved spectroscopic investigations of electronic and vibrational excitations.

O 35.15 Tue 18:30 P3

Near-field heat transfer of alkanethiol on flat gold surfaces — •Christian Olling[1], Ludwig Worbes[1], David Hellmann[1], and Achim Kittel[1,2] — [1]Energy and Semiconductor Research Laboratory, Institute of Physics, University of Oldenburg, 26129 Oldenburg, Germany — [2]Experimental Polymer Physics, Faculty of Mathematics and Physics, University of Freiburg, 79104 Freiburg, Germany

In this contribution we discuss the heat transport through a molecular layer on a heated or cooled surface. As molecules we have chosen alkanethiol because it is well known that alkanethiols form self-organized monolayers on flat gold surfaces. The measurements are performed with a near-field scanning thermal microscope (NSThM) which was developed by our group. A coaxial micro thermocouple serves as tip of a commercial variable temperature UHV-STM is able to measure the heat flux through the molecular layer without any interfering heat conduction by a surrounding gas. Hence, the microscope can be operated in NSThM and STM mode at the same time. Changes in the heat transfer are investigated by retracting the tip from the surface and the heat transfer of the bare gold surface. Furthermore, surface roughness and morphology influence the heat transfer on the nanometer scale. This is investigated by scanning over the surface and mapping the heat transfer.

O 35.16 Tue 18:30 P3

Design of a low temperature four-tip Scanning Tunneling Microscope — •Hubertus Junker, Vasily Cherepanov, Peter Coenen, Helmut Stollwerk, and Bert Voigtländer — Peter Grünberg Institut (PGI-3), Forschungszentrum Jülich, 52425 Jülich, Germany, and JARA-Fundamentals of Future Information Technology

The design of a low temperature ultra high vacuum (UHV) 4-tip Scanning Tunneling Microscope (STM) capable of charge and magneto transport measurements is presented. Four individual beetle-type STM units are stacked into each other in order to make the design as compact as possible. For the coarse approach of the tip towards the sample a new developed ultra compact nonpositioner which has a diameter of less than 3 mm is used. This multi tip STM is located inside the UHV part of a liquid Helium cryostat, which additionally hosts a 8 T superconducting magnet. In order to navigate the four tips a SEM is installed. The scanning areas on the sample overlap sufficiently in order to contact nanostructures with all four tips at the same time and execute transport measurements. To isolate the experiment from external vibrations, the chamber is located in a specially designed room. This room is sound protected and its 100 t concrete base plate rests on four air damping feet with a resonance frequency of 0.7 Hz. During tunneling, the experiment is controlled from the outside.

O 35.17 Tue 18:30 P3

Investigation of an operating resonant tunneling device by scanning tunneling spectroscopy — •Karen Teichmann[1], Martin Wenderoth[1], Rainer G. Ulbrich[1], Klaus Pierz[2], and Hans W. Schumacher[2] — [1]IV. Physikalisches Institut, Georg-August Universität Göttingen — [2]Physikalisch-Technische Bundesanstalt, Bundesallee 100, 38116 Braunschweig

A resonant tunneling diode structure in a three terminal setup was investigated by Cross-Sectional Scanning Tunneling Microscopy (STM) and Spectroscopy. We use a home built low temperature STM working under UHV conditions at 5 K, which allows applying a lateral voltage to the sample in addition to the usual tip-sample voltage. The diode structure was grown by molecular-beam epitaxy on a n^+-doped GaAs (100) substrate and consists of self-assembled InAs quantum dots embedded in AlAs barriers (4 nm) each followed by undoped GaAs prelayers (15 nm) [1]. The samples are cleaved in UHV to obtain a clean and atomically flat (110) surface perpendicular to the diode-structure. *I(V)* spectroscopy measurements were done with different applied lateral voltages. The shift of the valence band offset can clearly be seen. Differential conductivity peaks are visible to the left and right of the heterostructure and are explained by tip induced states. The shift of these states with lateral voltage can give insight in the tip induced band bending, which is known to be prominent on the GaAs (110) surface [2]. We acknowledge financial support by the DFG SPP 1285.

[1] I. Hapke-Wurst, *et al.*, App. Phys. Lett. **82**, 1209 (2003)
[2] R.M. Feenstra, *et al.*, J. Vac. Sci. Technol. B **5**, 923 (1987)

O 35.18 Tue 18:30 P3

Facts and artefacts in scattering scanning near-field optical microscopy. — •Anja Krysztofinski[1], Marc Tobias Wenzel[1], Rainer Jacob[2], Hans-Georg von Ribbeck[1], and Lukas M. Eng[1] — [1]Institut für Angewandte Photophysik, TU Dresden, 01062 Dresden, Germany — [2]Institut für Ionenstrahlphysik und Materialforschung, Helmholtz-Zentrum Dresden-Rossendorf (HZDR), 01314 Dresden, Germany

Scattering scanning near-field optical microscopy (s-SNOM) is a versatile tool for optically probing nanoscale systems in the visible and infrared wavelength range. In our setup, we used a He-Ne Laser with a wavelength of 633 nm for measurements in the visible and a CO2-Laser of 10.6 μm in the infrared range. To avoid misinterpretation of s-SNOM measurements, it is important to consider several kinds of artefacts that can affect the optical signal. Here, we present and classify the main types of artefacts that occur in s-SNOM measurements. Furthermore, artefacts are first theoretically described and then experimentally demonstrated. We focus on effects such as background scattering, geometrical topography artefacts, and feedback controller-induced effects. In addition, we will also present results on polarization effects and most importantly, optical contrast reversal as occurring for small nanoparticles. An important benefit of our set-up is the possibility to essentially avoid all such artefacts in order to obtain completely artefact-free results. For this purpose, we use higher harmonic demodulation, heterodyne interferometry and phase-locked-loop-based true-non-contact measurements in our s-SNOM set-up.

O 35.19 Tue 18:30 P3

Preparation and characterization of metal coated STM tips — •Sergej Burbach, Martin Wenderoth, Bernhand Spicher, and Rainer G. Ulbrich — IV. Physikalisches Institut, Georg-August Univ. Göttingen, Germany

We present an in situ preparation technique to produce scanning tunnelling microscopy tips coated with different metals and with a high reproducibility. This approach allows to vary the workfunction of STM tips or to prepare probes suitable for spin polarized STM. Based on a movable UHV chamber working at a base pressure of ($1 \cdot 10^{-10}$ mbar) the prepared tips can be transferred directly into the STM without breaking the vacuum.

As a starting point we use electrochemically etched tungsten tips with a radius of a few nanometer. After heating and sputtering the tips in UHV, thin metal films (e.g. Fe, Ag) are deposited using an electron beam evaporator. Monolayer thickness control is implemented using a quartz balance. To control the different steps of the tip preparation (heating, sputtering, deposition) the set-up allows in situ characterization using field emission. A quick switching between preparation and characterization is possible and leads to a high yield of atomically resolving tips. The different steps of the preparation have been controlled by ex situ scanning electron microscopy. This project is supported by SPP 1285.

O 35.20 Tue 18:30 P3

Scanning Force Microscopy up to the Millimeter Scale

— Alexander Förste[1,2], •Markus Moosmann[1,2], Manuel Rothenberger[1,2], Tobias Meier[1,2], Roland Gröger[1,2], Matthias Barczewski[1,2], Stefan Walheim[1,2], and Thomas Schimmel[1,2] — [1]Institute of Nanotechnology (INT), Karlsruhe Institute of Technology (KIT) Campus North — [2]Institute of Applied Physics and DFG-Center for Functional Nanostructures (CFN), Karlsruhe Institute of Technology (KIT) Campus South

Using a novel Scanning Force Microscope (SFM) allowing the so far largest scan range achieved (800 μm x 800 μm), surface topography and properties as well as surface processes were studied in a wide range of length scales from the nanometer scale to the sub-millimeter scale. The resolution of single monolayer steps is demonstrated even at ultra-large scan ranges. As sample systems we investigated 1) structured ultrathin films made from self-assembled monolayers, 2) thin self-organized polymer blend films structured via phase separation and 3) strongly corrugated surfaces produced by embossing or UV lithography.