(2PPE) signal for the Pt substrate, while the signal of the PS coating is independent of probe delay, presumably due to an highly filled intermediate state proposed before.

O 43.8 Tue 18:30 Poster F

Characterization of W-Tips used in Tuning-Fork Non-Contact Atomic Force Microscopy by Field Ion Microscopy — •Daniel-Alexander Braun[1], Jens Falter[1,4], Thomas König[2], André Schirmeisen[1,4], Hendrik Hölscher[4], Udo D. Schwarz[3], and Harald Fuchs[1,4] — [1]Institute of Physics, University of Münster, Münster, Germany — [2]Fritz-Haber-Institut der Max-Planck-Gesellschaft, Berlin, Germany — [3]Department of Mechanical Engineering, Yale University, New Haven, CT, USA — [4]Center for Nanotechnology (CeNTech), University of Münster, Münster, Germany

The atomic force microscope (AFM) is capable to image surfaces with atomic resolution. However, the interpretation of the atomic scale contrast is often difficult and inconclusive. This deficiency is partly caused by the unknown structure of the probing tip, as the chemical interaction between tip and surface and therefore the image contrast is largely determined by the exact configuration of the tip apex. Field ion microscope (FIM) images, on the other hand, enable a complete reconstruction of the atomic geometry of a sharp metallic tip. In this work, we present a special tip holder which can be used in both our home-built AFM and FIM. This combination allows to characterize the exact atomic structure of both interaction partners, the sample and the tip. First results are presented, where the apex radii of electrochemically etched tungsten tips are determined by FIM and subsequently correlated to force distance curves.

O 43.9 Tue 18:30 Poster F

Self-actuating self-sensing cantilever for dynamic AFM — •Henning von Allwörden, Alexander Schwarz, C. Julian Chen, and Roland Wiesendanger — Institute of Applied Physics, University of Hamburg, Jungiusstraße 11, 20355 Hamburg

Conventional AFM force sensors consist of a flexible cantilever beam made from silicon. For operation in the dynamic mode they are actuated by a driver piezo. Common methods for detection of the cantilever oscillation are optical techniques like beam deflection or interferometry. Hence, force sensor, its actuation and its detection are three separated devices. Combining them into a single device would make AFM instruments much simpler in design and handling. The qPlus sensor [1] is a tuning fork based on z-cut quartz. One arm is glued to a substrate, the other serves as a cantilever. The cantilever oscillation is detected by utilizing the piezoelectric effect of quartz via a pair of electrodes. However, excitation is still done externally. Furthermore, these sensors have large spring constants, resulting in a low force sensitivity. It is not possible to choose from a large variety of spring constants and resonance frequencies. Our idea is to place two pairs of electrodes, one for actuation and one for detection on a cantilever made from a single piece of x-cut quartz. Hence, we would have a self-actuating self-sensing cantilever [2]. Eigenfrequency and spring constant can be adjusted by choosing appropriate dimensions. The general concept of this sensor will be discussed and properties of prototypes will be presented.

[1] Giessibl, Appl. Phys. Lett. **73**, 3956 (1998)
[2] patent pending

O 43.10 Tue 18:30 Poster F

Strategies for measuring interfacial friction by lateral manipulation of nanoparticles using atomic force microscopy techniques — •T. Mönninghoff[1], D. Dietzel[1,2], L. Jansen[1,3], H. Fuchs[1,2,3], U. D. Schwarz[4], and A. Schirmeisen[1,2] — [1]Institute of Physics, University of Münster, Germany — [2]Forschungszentrum Karlsruhe (FZK), Germany — [3]Center for Nanotechnology (CeNTech), University of Münster, Germany — [4]Department of Mechanical Engineering, Yale University, New Haven, CT, USA

A promising approach for quantifying interfacial friction is to measure lateral forces during the manipulation of nanoparticles with the atomic force microscope. This technique allows addressing many current issues in the field of nanoscale friction, like the influence of contact size and interface crystallinity, which are not fully accessible with conventional friction force microscopy. We present different manipulation strategies that have been developed to either enable the defined and repeated manipulation of single nanoparticles or to gather statistical data on a larger ensemble of particles found within a particular scan area. Especially the latter approach allows fast and statistically significant data. In all cases, the particle-surface interfacial friction can be extracted from the additional torsional signal of the cantilever during the pushing process in contact mode operation [1]. As a model system for the demonstration of the different manipulation strategies, antimony nanoparticles with different diameters and crystallinity grown on a HOPG substrate have been chosen. [1] Dietzel et al., J. Appl. Phys.102, 084306 (2007)

O 43.11 Tue 18:30 Poster F

Design of an UHV-STM for applications at low temperatures and high magnetic fields — Daniel Haude[1], •Matthias Menzel[1], Kirsten von Bergmann[1], Matthias Bode[2], and Roland Wiesendanger[1] — [1]Institute of Applied Physics, University of Hamburg, Germany — [2]Center for Nanoscale Materials, Argonne National Laboratory, USA

We constructed a Scanning Tunneling Microscope (STM) for spin-polarized studies of magnetic adatoms on metallic surfaces. This STM is mounted in a commercial ^{3}He-Flow-Cryostat, which allows measurements in UHV conditions and at a magnetic field up to 9 T perpendicular to the sample. With ^{4}He in the gas loop we already reached a temperature of 1.16 K leading to an estimation of a temperature of 700 mK with ^{3}He in the cycle. Since the STM is fixed at the bottom of the cryostat insert, tip and sample are transferred without visibility using a magnetic drive for linear and rotary motions. The cryostat is mounted via a transfer chamber to an existing UHV system which has been described elsewhere [1].

Tips and samples can be transferred throughout the pre-existing UHV system thus allowing us to investigate the same samples with different STM's. With an electron beam evaporator we can deposit different magnetic materials onto the cold substrate enabling studies of magnetic properties of single atoms or clusters of few atoms.

[1] O. Pietzsch *et al.*, Rev. Sci. Instrum. **71**, 424 (2000)

O 43.12 Tue 18:30 Poster F

Einfluss der elektronischen Struktur der Tunnelspitze auf spektroskopische Messungen — •Oliver Ferdinand, Kirsten von Bergmann, André Kubetzka, and Roland Wiesendanger — Institut für Angewandte Physik, Universität Hamburg, D-20355 Hamburg

Die Raster-Tunnel-Spektroskopie (RTS) misst die lokale differentielle Leitfähigkeit. Diese ist bei kleinen Spannungen in erster Näherung proportional zur lokalen Zustandsdichte (LDOS) beider Elektroden, Probe und Tunnelspitze, und mathematisch eine mit dem Transmissionskoeffizienten gewichtete Faltung beider LDOS. Gerade wenn der relevante Bereich um das Fermi-Niveau E_F konzentriert ist, wie z.B. bei Kondo-Systemen oder inelastischen Prozessen, wirken sich daher Oberfläche und Spitze in gleichem Maße auf die gemessenen Spektren aus, so dass eine möglichst strukturlose LDOS der Tunnelspitze erforderlich ist.

Es wird gezeigt, dass sich verschiedene Spitzen-Materialien unterschiedlich auf die Spektren auswirken. Dazu wurden Wolfram, Iridium und Gold verwendet und sowohl in-situ als auch ex-situ [1] Präparationsverfahren ausprobiert.

[1] A. J. Melmed, J. Vac. Sci. Technol. B **9**, 601 (1991)

O 43.13 Tue 18:30 Poster F

Spin-dependent Image Potential States Studied By SP-STS — •Anika Emmenegger, Stefan Krause, Gabriela Herzog, André Kubetzka, Daniel Haude, and Roland Wiesendanger — Institute of Applied Physics, University of Hamburg, Germany

An electron approaching a metal surface feels the attractive force of the polarization charge it induces in the surface region of the solid. If the surface has a band gap near the vacuum level, the electron gets trapped by its own image, confined by the surface on the one side and the slowly decaying Coulombic potential on the other side. These image-potential induced surface states (IPS) form a Rydberg-like series close to the vacuum level. Though located relatively far away from the surface, they are still sensitive to the local elctronic, atomic and magnetic surface structure.

Consequently, spin-polarized scanning tunneling spectroscopy (SP-STS) of IPS allows to investigate the magnetic surface properties on a local scale but at tip-sample distances larger than in normal tunneling experiments, thereby reducing the probability of accidental tip-sample collisions [1]. However, STS performed by commercial scanning tunneling microscopes (STM) is usually limited to a maximum bias voltage of 10V. Going beyond this limit we are able to investigate spin-dependent IPS of higher order at further increased tunneling distances.

First measurements in a high voltage regime will be presented and