perimentation in both scanning tunneling microscopy (STM) and non-contact atomic force microscopy (NC-AFM) modes. An exchangeable tuning fork based Q-plus style sensor is used to allow for flexibility in choosing probe tip materials. The system features an on-top cryostat, where the microscope is enclosed in a double set of thermal shields. Tip as well as sample can be changed in-situ at low temperatures to keep turn-around times low. By opening the front shutters of the shields, unrestricted access from dedicated flanges permits the direct deposition of molecules or atoms on either tip or sample while they remain cold. As examples for the microscope's performance, we present data measured on Cu(111) in STM mode as well as on graphite in NC-AFM mode, featuring atomic resolution with corrugations of 4-5 pm and corrugations below 1 pm could be measured. In addition, atomic resolution data obtained by means of three-dimensional force spectroscopy is shown.

O 43.21 Tue 18:30 Poster F

Energy dissipation of ballistic injected electrons and holes through individual molecules — •Alexander Bernhart[1], Mark Kaspers[1], Bastian Weyers[1], Evgeny Zubkov[1], Christian Bobisch[2], and Rolf Möller[1] — [1]Department of Physics, University of Duisburg-Essen, 47048 Duisburg, Germany — [2]University of California, Irvine, USA

Ballistic Electron Emission Microscopy (BEEM) not only represents an ideal technique to study the electronic transmission at the Schottky-interface between a metal and a semiconductor, but moreover it allows to analyze the ballistic transport through adsorbates on top of a metal. Bismuth (Bi) films with a thickness of 3-4nm were grown on n-doped and p-doped Si(100) and Si(111). Recently we could analyze the ballistic transport of electrons through two different molecular adlayers, PTCDA and C_{60}, deposited on top of the Bi film. In addition the ballistic transport of holes through an adlayer of C_{60} was studied. All experiments were performed by a modified "Nanoprobe"system (Omicron) providing four STM units which may be operated independently on the same sample. In this case one STM unit was used to contact the metal layer, and other one is operated as a conventional STM at negative or positive tip bias, hence injecting electrons or holes into the sample surface.

O 43.22 Tue 18:30 Poster F

surface velocity of shear quartzes for high speed friction measurements — •Fengzhen Zhang[1], Othmar Marti[1], Stefan Walheim[2], and Thomas Schimmel[2] — [1]Uni Ulm — [2]Uni Karlsruhe/FZK

Investigations of the friction properties with the relative low speeds(micrometer/s) have been carried out with Atomic Force Microscopy(AFM). Technologically relevant friction processes operate at speeds of several m/s. Due to the limitation of the piezo scanners in standard AFM, a new oscillation setup is required for the microscopic research on high speed friction. We have measured the surface velocity of shear quartzes. In this presentation we show the calibration setup and results of the surface speed for 3MHz quartzes. We discuss the influence of surface inhomogeneities on the accuracy of the velocity measurement. As a first application we present friction measurements obtained on structured films deposited on shear quartzes.

O 43.23 Tue 18:30 Poster F

Scanning tunneling microscopy measurements of graphene on an insulating substrate. — •Viktor Geringer[1], Sven Runte[1], Marcus Liebmann[1], Tim Echtermeyer[2], Reinhard Rückamp[1], Max Lemme[2], and Markus Morgenstern[1] — [1]II. Physikalisches Institut, RWTH Aachen and JARA-FIT, Otto-Blumenthal-Straße, 52074 Aachen — [2]Advanced Microelectronic Center Aachen (AMICA), AMO GmbH, Otto-Blumenthal-Str. 25, 52074 Aachen

We present scanning tunneling microscopy (STM) measurements of single and few layer graphene examined under ultrahigh vacuum conditions. The samples were prepared on a silicon dioxide surface by mechanical exfoliation of a graphite crystal and contacted by depositing gold electrodes around the graphene flake. An instrumental challenge in STM investigations of small graphene flakes is the tip positioning with respect to the sample. We solved this technical problem by using an optical long-distance microscope and a x-y-positioning drive for the STM sample stage. A lateral pre-positioning precision of 5-10 μm has been achieved.

We show atomically resolved and large-scale topographic images of the graphene surface as well as first scanning tunneling spectroscopy (STS) results.

O 43.24 Tue 18:30 Poster F

A UHV-STM system for measurements at 300 mK and 14 T — •Stefan Becker, Marcus Liebmann, and Markus Morgenstern — II. Physikalisches Institut B, RWTH Aachen and JARA-FIT, Otto-Blumenthal-Straße, 52074 Aachen

We have designed an ultrahigh vacuum (UHV) system featuring a homebuilt scanning tunnelling microscope (STM) inside of a 300 mK cryostat with a 14 T solenoid magnet exhibiting a single-shot time of 100 h. Two independent chambers hold various instruments for sample and STM tip preparation, including sample heaters, a sputter gun, evaporators and a combined LEED/Auger system. The STM body is compact and rigid (Ø 30 mm) for stability and high resonance frequencies. It has an *in situ* tip exchange mechanism and a sample positioning stage. The whole system is supported by air damping legs inside an acoustically insulating room.

O 43.25 Tue 18:30 Poster F

Development of TERS System with Scanning Capability — •Seth White, Dietrich Wulferding, Alexander Doering, Hongdan Yan, Pushpendra Kumar, and Peter Lemmens — IPKM, TU-Braunschweig

The combination of Tip-Enhanced Raman Spectroscopy with real-time surface characterization in one experimental setup shows great promise as a method for precise local measurement of spatially confined systems. After employing an AFM with an etched [1] nano-apex scanning tip made of Ag or Au[2] to gain structural information one can immediately use the same tip to substantially increase Raman activity at a particular point of interest. Single molecules trapped near the surface of nano-porous oxidized silicon and alumina can be investigated using this finely tunable, highly directed approach.

O 43.26 Tue 18:30 Poster F

Use of a "needle-sensor" for non-contact scanning force microscopy and simultaneous measurement of the tunneling current — Bert Voigtländer[1] and •Irek Morawski[1,2] — [1]Institute of Bio- and Nanosystems (IBN 3), and cni – Center of Nanoelectronic Systems for Information Technology, Research Centre Jülich, 52425 Jülich, Germany — [2]Institute of Experimental Physics, University of Wrocław, pl. Maxa Borna 9, PL 50-204 Wrocław, Poland

A simultaneous measurement of forces and tunneling current during imaging of surfaces is of great interest. We present AFM/STM images of graphite and metal surface obtained by means of the quartz needle-sensor with an attached tungsten tip at ambient conditions. The needle sensor is an extensional mode quartz oscillator operating at a frequency of 1 MHz and one is similar to a tuning fork sensor more frequently used in scanning force microscopy. This sensor has been operated with a phase locked loop (PLL) control extended with an additional electronic circuit, namely an attenuator, two band-pass amplifier stages, providing both: sub-angstroms mechanical oscillation amplitude and high signal/noise ratio. Dependences of the frequency shift against a tip-surface displacement measured for mentioned surfaces are presented. A "feedback circuit enabled"method of a calibration of the needle-sensor vibration amplitude is proposed and discussed.

O 43.27 Tue 18:30 Poster F

Construction of a Fibre-Tip SNOM for Investigation of Soft Organic Materials — •Philipp Lange[2], Omar Al-Khatib[1], Dörthe M. Eisele[1], Mario Dähne[2], Jürgen P. Rabe[1], and Stefan Kirstein[1] — [1]HU-Berlin, Institut für Physik, Newtonstr. 15, 12489 Berlin — [2]TU Berlin, Institut für Physik, Hardenbergstr. 36, 10623 Berlin

The setup of a fibre-tip scanning near field optical microscope (SNOM) is presented that was specially designed for the investigation of soft organic materials in air providing low tip-sample interaction, low thermal drift, and high topographic resolution. For topographic scanning the shear force of a fibre probe is detected. For this a tapered glass fibre probe is mounted on a tuning fork piezo which is forced to oscillate above the resonance frequency. The phase shift induced by the tuning fork is taken as a sensitive signal for damping of the tip oscillation due to tip-sample interaction and used for distance control. A dye laser is coupled into the fibre for near field optical excitation of the sample. The scanning unit is mounted on top of an inverted fluorescence microscope that allows comfortable adjustment and micro-positioning of tip and sample, preselection of scan areas of prior interest, and very efficient far-field detection of the luminescence. First images of fluorescent