O 58: Surface Science: Misc.

Time: Tuesday 18:30–20:30 Location: P2-EG

O 58.1 Tue 18:30 P2-EG

Effect of the sub-surface on the surface revealed by Scanning Probe Microscopy on irradiated graphitic surfaces — •Cem Kincal[1], Dilek Yildiz[1,2], Umut Kamber[1], Clara Grygiel[3], Cornelis J. van der Beek[4], and Oğuzhan Gürlü[1] — [1]Istanbul Technical University, Istanbul, Turkey — [2]University of Basel, Basel, Switzerland — [3]Université dé Caen, Caen, France — [4]Ecole Polytechnique, Palaiseau, France

Comet-like and hillock like structures on swift heavy ion (SHI) irradiated HOPG surfaces have already been reported. We have shown that it is possible to obtain atomic resolution on the tail section of the comet-like structures with STM. Such STM data proved that the interaction of SHI with the bulk does not damage surface layers except for the entry point. Friction force microscopy showed complementary results to our STM measurements. Interestingly, we observed that the tail sections of the comet-like structures appeared on the friction maps, although they could not be observed in simultaneously taken topography maps. Intriguingly, tail sections showed less friction compared to the pristine HOPG surface. Our results indicate the friction between two surfaces can also be a function of the bulk material. Moreover, we have studied SHI irradiation of moiré zones formed on HOPG. Data revealed that irradiation of moiré zones under grazing incidence did not show any unzipping or folding of the top most graphene layer generating the moiré pattern.

O 58.2 Tue 18:30 P2-EG

Electrostatic, phononic and van der Waals friction on layered materials — •Dilek Yildiz, Marcin Kisiel, and Ernst Meyer — Universität Basel, Basel, Switzerland

An unintuitive friction is caused due relative motion of bodies with a few nanometres gap in-between. This non-contact friction phenomenon still awaits to be understood completely. Effects of such non-contact friction can be measured by oscillating a highly sensitive cantilever like a tiny pendulum over a surface. We studied with TaS2 and HOPG crystal surfaces, which are well known layered structures. Energy dissipation spectra measured on both materials have shown clear differences. While electrostatic interaction causes energy dissipation on TaS2 at low temperatures, van der Waals friction is observed on the same sample at high temperatures due to the phase transition. Rather, we observed the lack of electrostatic friction on HOPG and we measured phononic type of friction, which is due to the short range forces. Mechanism of energy dissipation on TaS2 depends on a temperature driven phase transition of the crystal. In this presentation we will discuss three different mechanisms of non-contact friction: Friction due to electrostatic, van der Waals and phononic interactions between tip and the sample.

O 58.3 Tue 18:30 P2-EG

Optical properties of laser-excited metals under nonequilibrium conditions. — •Pascal D. Ndione[1], Sebastian Weber[1], Dirk O. Gericke[2], and Baerbel Rethfeld[1] — [1]Department of Physics and Research Center Optimas, University of Kaiserslautern, Erwin-Schroedinger-Strasse 46, 67663 Kaiserslautern, Germany — [2]Centre for Fusion, Space and Astrophysics, Department of Physics, University of Warwick, Coventry CV4 7AL, United Kingdom

Improving our understanding of the response of materials under intense laser irradiation is critical for various applications. The modification of optical properties is also a key feature for fundamental science as reflectivity or transmission carry many information about the correlated many-body system. The present contribution investigates the behavior of metals subjected to short laser pulses of visible light. For metals, the laser directly excites the electrons which drives them out of equilibrium. On a time scale of a few tens to hundreds femtoseconds after laser irradiation, the electrons thermalize to a Fermi distribution at an elevated temperature. We are interested in the optical properties of metals under the nonequilibrium conditions during the relaxation process. Different approximations of the dielectric function are compared for thermalised metals. Then, we aim to include nonequilibrium electron distributions into the dielectric function.

O 58.4 Tue 18:30 P2-EG

Novel Reflection High-energy Positron Diffractometer at NEPOMUC — •Matthias Dodenhöft and Christoph Hugenschmidt — Heinz Maier-Leibnitz Zentrum (MLZ) and Physics Department E21, Technische Universität München, Lichtenbergstr. 1, 85748 Garching b. München, Germany

The precise knowledge of the surface structure is essential to understand e.g. chemical reactions, optimize catalytic techniques or develop nanoelectronic devices. It has been shown that Total Reflection High-energy Positron Diffraction (TRHEPD) is a powerful tool to determine the positions of adatoms and topmost layers of reconstructed surfaces with unprecedented accuracy. In contrast to the application of high-energy electrons in RHEED, positrons exhibit the phenomenon of total reflection at surfaces due to their positive scattering potential. For this reason, TRHEPD shows outstanding surface sensitivity and thus provides information, which cannot be obtained with other techniques such as RHEED or SXRD.

In order to enable TRHEPD experiments, we intend to set up a new positron diffractometer coupled to the high-intensity positron beam NEPOMUC, located at the research reactor FRM II in Munich. Beside the identification of surface structures, this setup will also enable us to investigate surface related phenomena such as phase transitions, reconstruction or surface melting. This project is supported by the BMBF (funding number 05K16WO7).