MI 9: Progress of Instrumentation and Methods for the Surface Analysis (PEEM, LEED)

Chair: Barbara Adolphi (TU Dresden)

Time: Thursday 11:15–11:45 Location: MER 02

MI 9.1 Thu 11:15 MER 02

In-situ electrochemistry in photoemission microscopy — •Slavomir Nemsak[1], Claus M. Schneider[1], and Andrei Kolmakov[2] — [1]PGI-6, Forschungszentrum Juelich, 52425 Juelich, Germany — [2]Center for Nanoscale Science and Technology, NIST, Gaithersburg, MD, USA

Until recently, photoemission electron microscopy (PEEM) could not be used in studies of solid/liquid interfaces due to major instrumental and experimental difficulties. The usual technique of differential pumping, which allows photoelectrons to reach the detection in ambient pressure photoemission spectroscopy, cannot be simply realized in PEEM, mostly due to the presence of high potential difference between a specimen and extractor lens. One of the ways to overcome this problem is to use a sample capped with electron transparent molecularly impermeable membrane, which would leave the vacuum conditions between the lens and the sample unaffected [Kolmakov, A et al., Nature Nanotechnol. 6, 651 (2011)]. Application of different potentials at various points on the sample is another ingredient, which would enable doing spectromicroscopy with electrochemistry.

We present a working concept of electrochemical cell inside a photoemission microscope. Our demonstration uses a capping membrane made of a few-layer graphene. In this configuration, the graphene membrane acts also as a top electrode Kolmakov, A et al., Topics in Catalysis 59, 448 (2016)]. A liquid contained in the cell is then imaged primarily with secondary or Auger photoelectrons under operating conditions.

MI 9.2 Thu 11:30 MER 02

Development of an ultrafast miniaturized low-energy electron gun — •Gero Storeck, Simon Vogelgesang, Murat Sivis, Sascha Schäfer, and Claus Ropers — 4th Physical Institute - Solids and Nanostructures, University of Göttingen, Germany

Ultrafast low-energy electron diffraction was recently shown to be a promising approach to access ultrafast structural dynamics in 2D systems [1]. In order to realize ULEED in a backscattering geometry, we developed several designs of miniaturized pulsed electron guns based on a nanometric tungsten photocathode. Specifically, we fabricate downscaled electron sources with an outer diameter of about 80 μm that allow for a working distance from the sample below several hundred micrometers. A photolithographic process and focused ion beam etching are used to construct the electrostatic gun assembly hosting a nanotip photocathode and a lens for electron beam collimation.

We characterize the low-energy electron pulses by the transient electric field effect and achieve pulse durations down to 1 ps at electron energies as low as 50 eV. This enables us to conduct time-resolved measurements in reflection geometry for the study of ultrafast structural transformations and phase transitions at surfaces.

[1] M. Gulde et al., Science 345, 200 (2014).