In-situ Microscopy, Spectroscopy, and Microfluidics Focus Topic
Room Hall B - Session MM-TuP
In-situ Microscopy, Spectroscopy, and Microfluidics Focus Topic Poster Session

MM-TuP1 In-situ Low Energy Electron Microscopy at Near Ambient Pressures*, **Thomas Schulmeyer**,* SPECS Surface Nano Analysis GmbH

Low-energy electron microscopy (LEEM) is a spectromicroscopy technique which allows the study of dynamic processes at surfaces and interfaces, such as thin-film growth, surface reactions, and phase transitions. With the FE-LEEM P90 from SPECS, which is based on the instrument design by Rudolf Tromp from IBM, lateral and energy resolution of below 5 nm and 250 meV, respectively, can be achieved. Depending on the excitation source and the settings on the instrument, a variety of different imaging modes are possible: mirror electron microscopy, low energy electron diffraction (LEED), phase contrast imaging, reflectivity contrast, dark field imaging and bright field imaging, as well as photoelectron emission microscopy and spectroscopy. As a new development, the technical capabilities of LEEM and PEEM have been extended toward near ambient conditions by developing a special objective lens concept and sample chamber geometry. This enables the analysis of materials and devices under near ambient conditions and even in situ during operation. For this a Laser heater allows for sample temperatures up to 800°C during the measurements. The technical realization will be presented in detail. Furthermore experimental results will be shown on Graphene, Silicon under Nitrogen atmosphere. First results from real surface reactions will be discussed.

MM-TuP2 NanoESCA III: Recent Progress and Applications*, M. Merkel, N.B. Weber, M. Escher, T.-J. Kühn,* FOCUS GmbH, Germany*; **Marten Patt**,* Scienta Omicron GmbH, Germany

During the last years essential progress has been made in developing the technique of energy filtered photoemission electron microscopy (PEEM). Different approaches of imaging energy filtering have been introduced and developed more and more.

One of the most essential achievements was in 2003 the invention [1] and design of the imaging double energy analyser (IDEA), an aberration compensated band pass filter. This PEEM dedicated energy filter became the core element of the NanoESCA III instrument. Its unique design allows for high quality imaging of band pass filtered PEEM images at UV light excited threshold energies for e.g. work function mapping up to hard x-ray energies (HAXPEEM) [2] for bulk sensitive measurements.

Both the real and the momentum space of a sample can be imaged by direct switching in between both modes. The latter so called momentum microscopy, acquiring the full band structure from a microscopic sample region of interest, becomes a more and more popular alternative to the common ARPES set-up using a single hemispherical analyser. Besides elimination the major component of the analyser's spherical aberration, the tandem arrangement also largely retains the time structure of the electron signal, unlike a single hemispherical analyser which can be helpful with time resolving experiments.

We will show some recent applications [3] and instrumental set-ups taking advantage of these possibilities.

[1] D. Funnemann, M. Escher, European Patent EP 1 559 126 B1, US patent US 7 250

599 B2

[2] Patt et al., Rev. Sci. Instrum. 85, 113704 (2014)

[3] see e.g.: Ming-Wie Chen et al., npj 2D Materials and Applications (2018) 2:2 ; doi:10.1038/s41699-017-0047-x

Author Index

Bold page numbers indicate presenter

— E —
Escher, M.: MM-TuP2, 1
— K —
Kühn, T.-J.: MM-TuP2, 1
— M —
Merkel, M.: MM-TuP2, 1
— P —
Patt, M.: MM-TuP2, **1**
— S —
Schulmeyer, T.: MM-TuP1, **1**
— W —
Weber, N.B.: MM-TuP2, 1