

O 15: Methods: Other Experimental Techniques I

Time: Monday 15:30–16:45

Location: MA 041

O 15.1 Mon 15:30 MA 041

Tip-enhanced Raman Spectroscopy with a High NA Parabolic Mirror — •DAI ZHANG, CATRINEL STANCIU, MARKUS SACKROW, KAI BRAUN, and ALFRED J. MEIXNER — Institut für Physikalische und Theoretische Chemie, Auf der Morgenstelle 8, 72076 Tübingen

Tip-enhanced Raman spectroscopy (TERS) allows chemical information collection with a sensitivity reaching single molecule level and a spatial resolution in the range of 10 nm. The efficient excitation and collection of the plasmon-enhanced optical signals of species present in the tip-sample nano-gap between the tip apex and the substrate are crucial for TERS. The optical excitation field has to be polarized along the gap and the field emerging from the gap has to be observed from the side. These geometrical restrictions require the side-illumination and light collection using a low-NA lens, limiting the sensitivity of the measurements. We present a novel method to overcome this problem based on a confocal optical microscope with a high NA parabolic mirror for the excitation and the detection instead of the objective lens. The sample is arranged co-axially with the axis of the parabolic mirror and the gap is centered in the focus. Hence localized plasmons can be efficiently excited parallel to the surface we illuminate the parabolic mirror with a radially polarized doughnut mode and the field developed from the gap can effectively be collected by the rim of the parabolic mirror and directed to the detection system. Examples about tip-enhanced imaging and spectroscopy of nanomaterials and biological systems will be shown to demonstrate the efficiency of this modification.

O 15.2 Mon 15:45 MA 041

Static speckle experiments using white synchrotron radiation — •TUSHAR SANT, TOBIAS PANZNER, and ULLRICH PIETSCH — Solid State Physics Group, University of Siegen, 57068 Siegen, Germany

Static speckle experiments were performed using coherent white X-ray radiation from a bending magnet at BESSYII. Semiconductor and polymer surfaces were investigated under incidence condition smaller than the critical angle of total external reflection. The scattering pattern of the sample results from the illumination function modified by the surface undulations [1]. The periodic oscillations are caused by the illumination function whereas other irregular features are associated with sample surface. The speckle map of reflection from a laterally periodic structure like GaAs grating is studied [2]. Under coherent illumination the grating peaks split into speckles because of fluctuations on the sample surface. It is important to understand which length scales on the sample surface are responsible for the oscillations in reflectivity map. To investigate this experiments are done with a triangular shaped sample. Different parts of the sample are illuminated with the footprint on the sample larger or smaller than the actual sample length. This gives prior information about total illuminated area on the sample. Using this additional information a detailed surface profile of the sample is reconstructed. 1. Pietsch U, et al. *Physica B-Condensed Matter*, 357 (2005) 45. 2. Panzner T, et al. *Thin Solid*

Films, 515 (2007) 5563.

O 15.3 Mon 16:00 MA 041

TER-XSW investigation of CoPt₃ nanoparticle films on Si and Sapphire substrates — •ARDALAN ZARGHAM¹, THOMAS SCHMIDT¹, RADOWAN HILDEBRAND¹, BERNHARD GEHL², MARCUS BÄUMER², and JENS FALTA¹ — ¹Institute of Solid State Physics, University of Bremen, Germany — ²Institute of Physical Chemistry, University of Bremen, Germany

CoPt₃ bimetallic colloidal nanoparticle films on Si and sapphire substrates are investigated concerning the real space distribution of Co and Pt in specifically defined layers above the substrates as well as the structural dependency on plasma treatments. TER-XSW is considered to be a suitable method for these types of investigation because of its ability of material specification in vertical resolution. It is simultaneously possible to understand the surface morphology by means of XRR.

O 15.4 Mon 16:15 MA 041

Coherent reflectivity using white synchrotron radiation — •TOBIAS PANZNER, TUSHAR SANT, and ULLRICH PIETSCH — Universität Siegen, Festkörperphysik, Walter-Flex-Str. 3, 57068 Siegen, Germany

Using coherent white synchrotron radiation in the hard x-ray region for reflectivity experiments one has access to sample properties on a nanometer scale in principle. To extract the wanted information from the performed measurements so called phase retrieval algorithms are necessary. The authors developed a straight forward simulation program based on a spatial limited atomic flat surface to evaluate the influence of different parameters on the coherent scattered signal in the detector plane. These simulations can explain some interesting features of the measurements and shows unexpected results for the influence of the so called illumination function.

O 15.5 Mon 16:30 MA 041

BEST - Beamline for Education and Scientific Training - A new VUV beamline at BESSY II — •THORSTEN ZANDT, CHRISTOPH JANOWITZ, and RECARDO MANZKE — Institut für Physik, Humboldt-Universität zu Berlin, Newtonstraße 15, 12489 Berlin

A high-resolution 5 m normal-incidence-monochromator beamline behind the dipole DIP 03-1B at BESSY II is described. It covers the energy range of 3–40 eV. The beamline is designed for high-resolution photoelectron spectroscopy utilizing a Scienta SES-2002 electron analyzer, which is permanently placed as an endstation at the beamline. A high precision manipulator on a closed-cycle He cryostat allows angle-resolved measurements over 2 π steradian below 10 K. For BEST it is planned to introduce and qualify continuously students and young scientists into the fascinating possibilities of synchrotron radiation research. Optical design of the beamline and preliminary performance results will be discussed.