DS 3: Thin Film Properties I: Methods

Time: Monday 15:00–16:00 Location: REC/C213

DS 3.1 Mon 15:00 REC/C213

Update on the IBA activities in Bonn — •Henry Schumacher, Dennis Sauerland, and Sebastian Neubert — Helmholtz-Institut für Strahlen und Kernphysik, Universität Bonn

The *Bonn Isochronous Cyclotron* can accelerate protons, deuterons and light ions with nominal energies of 7 to 14 MeV/nucleon. At one of the five beam lines, a new experimental site for material analysis is in development.
This new experiment will house a small number of surface barrier detector for RBS (backwards direction) and beam characterization (off-axis, foward direction) as well as a silicon drift detector for PIXE measurements and utilize a low energy alpha particle beam.
In this talk, a general overview over the setup and progress, preliminary detector tests, count rate estimations and preparatory measurements will be presented.

DS 3.2 Mon 15:15 REC/C213

The TXPES Beamline at SESAME: A New Facility for Advanced Soft X-ray Photoelectron Spectroscopy — •Zeynep Reyhan Ozturk — TARLA, Ankara, Turkey — SESAME, Balqa, Jordan

The TXPES (Turkish X-ray Photoelectron Spectroscopy) beamline at SESAME is a newly installed soft X-ray facility dedicated to high-resolution XPS, UPS, and ARPES for advanced surface and interface analysis. With a broad tunable photon-energy range, TXPES enables detailed investigation of electronic structure, chemical composition, band dispersion, and oxidation states in a wide variety of materials.

The end station features a multi-chamber UHV system including a preparation chamber, an analysis chamber, and a high-pressure cell for in situ and near-ambient pressure studies. The analysis chamber houses a hemispherical electron energy analyzer capable of XPS/UPS/ARPES, along with an ion gun, LEED, and LEIS, enabling comprehensive structural and chemical characterization at different depth sensitivities. TXPES combines tunable soft X-rays, high-resolution electron spectroscopy, and controlled environments to study surface oxidation, adsorption, catalysis, thin-film interfaces, and electronic band alignment with exceptional sensitivity. The integration of a high-pressure cell expands these investigations to realistic gas conditions, bridging the gap between model systems and real-world applications. The beamline represents a major collaborative effort between Turkish institutions and SESAME and is progressing toward full operation and user access in the near future.

DS 3.3 Mon 15:30 REC/C213

Bringing Synchrotron-Level HAXPES to the Lab: DeepCore-X for Buried Interface Characterization — •Martin Schmid[1], Elin Cartwright[2], Eleni Anargirou[1], Marcus Lundwall[2], and Susanna Eriksson[2] — [1]Scienta Omicron GmbH, Limburger Str. 75, 65232 Taunusstein — [2]Scienta Omicron AB, Danmarksgatan 22, 75323 Uppsala

Buried interfaces in multilayer semiconductor devices, such as MOSFETs, solar cells, and memory architectures, critically impact performance and reliability. Hard X-ray Photoelectron Spectroscopy (HAXPES), with greater information depth than conventional XPS, enables nondestructive analysis of buried layers. We introduce DeepCore-X, a next-generation lab instrument combining soft and hard XPS in one system, delivering synchrotron-like performance. Powered by a Ga Kα MetalJet source (9.25 keV), it offers 1000 W continuous operation and a hundred-fold intensity advantage over other lab HAXPES sources. The system supports high-throughput measurements across complex stacks. Automated sample handling, multi-point acquisition, and operando bias capabilities make it ideal for evaluating band bending, trap states, and chemical shifts. We will present recent results and application examples, including non-destructive depth profiling, to demonstrate how DeepCore-X bridges the gap between surface analysis and full device stack characterization without requiring synchrotron access.

DS 3.4 Mon 15:45 REC/C213

Simulation-Guided GIXPS: How to Maximize Signal and Depth Sensitivity in Photoelectron Emission Experiments — •O. Rehm[1], E. Kusari[1], D. Capalbo[1], A. Gloskovskii[2], C. Schlueter[2], L. Baumgarten[3], and M. Müller[1] — [1]Fachbereich Physik, Universität Konstanz, 78457 Konstanz — [2]DESY, 22607 Hamburg — [3]FZ Jülich GmbH, PGI-6, 52425 Jülich

(Hard) X-ray Photoelectron Spectroscopy ((HA)XPS) is a powerful technique for probing the chemical and electronic structure of thin films, interfaces, and multilayers, but access to synchrotron radiation is typically highly limited. To address this constraint, we present a simulation-guided approach that optimizes (HA)XPS experiments through grazing-incidence (GI) geometries. At GI angles (0.3°-2°) refraction and total reflection of X-rays generate pronounced angle-dependent interference effects that shift the weighted contribution maximum of photoelectrons to well-defined depths within the sample. Our approach - GIXPS - predicts these conditions in advance, enabling targeted enhancement of surface, interface, or bulk sensitivity. It boosts photoemission intensity by up to two orders of magnitude at characteristic GI angles, enabling faster data acquisition and better depth resolution while preserving the element-specificity of (HA)XPS. This methodology provides a practical route to more efficient, depth-selective experiments and is a powerful tool for designing and carrying out optimized interface- and bulk-sensitive (HA)XPS measurements - thus enabling the more efficient use of limited synchrotron beamtime.
O. Rehm *et al.*