HAXPES at PETRA III: electronic structure, *operando* devices and *in-situ* catalysis

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ABSTRACT

In September 2018, a new X-ray undulator beamline (P22), fully dedicated to hard X-ray photoelectron spectroscopy (HAXPES) techniques, opened to users. This beamline has been designed to the specific needs of the HAXPES user community [1,2]. Adaptive beam focusing is realized by Be compound refractive lenses and/or horizontally deflecting mirrors down to a spot size of ~15x17 μm^2 with a flux of up to $1.1x10^{13}$ ph/s (for Si(111) at 6 keV).

P22 hosts four specialised experimental end stations for high-resolution studies of the electronic and chemical structure of complex materials, realistic device-like structures and catalytic interfaces. The main instrument for conventional HAXPES techniques offers sample cooling and in-situ electrical characterisation for *operando* studies. A separate instrument provides full-field, sub-µm electron spectro-microscopy (HAXPEEM). Additionally, a specialized setup for high-pressure HAXPES applications (POLARIS) recently demonstrated its capabilities at pressures >2.0 bar. Finally, a full-field *k*-microscope with time-of-flight energy discrimination delivered first fully *k*-resolved valence band structures in the HAXPES energy range (up to 7 keV). All instruments are implemented and operated in close collaboration with external user groups and as such reflect the wide range of scientific fields currently covered by our community.

Following a short presentation of the beamline capabilities I will highlight recent results from the instruments operated at P22.

REFERENCES

1. C. Schlueter, A. Gloskovskii, et al. AIP conference proceedings **2054**(1), 040010 (2019)
2. C. Schlueter, A. Gloskovskii, et al. Synchrotron Radiation News **31**, 29–35 (2018)