Contribution ID: **78** Type: **Oral contribution**

Innovative Solutions for APXPS at Scienta Omicron

Tuesday, 6 December 2022 18:40 (20 minutes)

Investigating reaction intermediates, oxidation states, solid-liquid interfaces and buried interfaces under near ambient pressure conditions is highly desired in materials science applications. Ambient pressure X-ray photoelectron spectroscopy (APXPS) is a powerful method to investigate the chemical nature of surfaces and interfaces and has undergone a tremendous improvement in the last years. The development of the HiPP analysers allowed to overcome the one bar pressure regime without using pressure separating membranes [1,2]. The virtual cell approach implemented in Scienta Omciron's BAR XPS system, allows for sub-second gas exchange rates at sample surfaces and thereby allowing to study time dynamics [3]. Successful investigation of solid-liquid interfaces [4,5] is achieved by a sophisticated pre-lens design in which efficient pumping between two close-by apertures allows dragging out corrosive gases or moisture, which would otherwise be detrimental to the instrument.
During the past decade, increased attention has been shown to laboratory based APXPS system solutions, which is motivated by the 24/7 access capability and possibility for highly customized sample environments. Drawing on extensive experience in the fields of photoelectron spectroscopy, UHV technology, and system design, Scienta Omicron has designed the HiPPLab as an easy-to-use system that encourages user creativity through flexibility, modularity and an innovate chamber design. It combines a state-of-the-art HiPP analyser with a new high flux, variable focus X-ray source. Multiple options complement the HiPPLab offer, these include glovebox, preparation chamber, electrochemical cells, dip&pull method, options for photo-induced electrochemistry, laser heating, mass-spectroscopy, and UV-light source and many more. Using automated gas-flow controllers, experiments can be conducted in a controlled way.
The HiPP-3 analyser features a 2D detector allowing for spatial resolved measurements with customer proven results down to 2.8 μm resolution [6]. The swift acceleration mode allows for high electron transmission without applying a sample bias.

In this presentation, we will give an overview on our APXPS product portfolio and present application examples.

[1] Takagi et al. Applied Physics Express, 10 (2017)
[2] Amann et al. Review of Scientific Instruments, 90 (2019)
[3] Knudsen et al. Nature Commun., 12 (2021)
[4] Novotny et al. Review of Scientific Instruments, 91 (2020)
[5] Axnada et al. Sci. Rep., 5 (2015)
[6] Cai et al. Nucl. Sci. Tech., 30 (2019)

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No

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Track Classification: Technical developments