



Contribution ID: 85

Type: **Oral contribution**

Routine operando studies with Near Ambient Pressure XPS

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

For the last ten years XPS under near ambient pressure conditions (NAP-XPS) has gained significant attention in the XPS community. The technique allows for standard analysis of samples under pressures up to about 50 mbar. This opens XPS to liquids, solid-liquid interfaces, gas-solid-interfaces, gas-liquid-interfaces. New fields like operando studies on electrochemical systems, corrosion experiments, analysis of food samples, but also studies of biological samples have been added to the XPS portfolio. The background gas pressure in such experiments is beneficial for the analysis of materials, because it avoids beam damages and degradation due to UHV conditions and also enables true non-destructive analysis of all types of degassing samples and insulators.

In this presentation, we demonstrate the enormous potential of laboratory NAP-XPS for investigations of solid-liquid interfaces in electrochemical energy storage systems at elevated pressures, also illustrating the ease of use of the setup used.

We show different examples with increasing level of complexity from solid liquid interface studies, like obtaining relevant results on Silicon in different organic solvents without the need of highly sophisticated setups, all the way to complex experiments such follow the effects of metal corrosion in organic acid.

Most sophisticated experiments so far have been operando electrochemistry in a classical three-electrode setup. A versatile setup is presented, allowing for studies of solid-electrolyte interfaces for example in Lithium-ion batteries as a simple laboratory experiment. First experiments on a V₂O₅ cathode in 1 molar LiPF₆ in EC/DMC electrolyte solution show the operando intercalation of Lithium into the cathode and the related changes in its chemical compositions. A control experiment after air exposure of the intercalated cathode demonstrate need for inert environments during measurements.

if "Other", please specify:

I apply for a travel grant

No

Primary authors: MIRABELLA, Francesca (SPECS Surface Nano Analysis GmbH); Dr DIETRICH, Paul (SPECS Surface Nano Analysis GmbH); Dr THISSEN, Andreas (SPECS Surface Nano Analysis GmbH)

Presenter: MIRABELLA, Francesca (SPECS Surface Nano Analysis GmbH)

Track Classification: Technical developments