



Contribution ID: 66

Type: **Oral contribution**

CO oxidation on copper surfaces: A demonstration of simultaneous Ambient Pressure IRRAS and XPS at the HIPPIE beamline.

Tuesday, 6 December 2022 18:00 (20 minutes)

The HIPPIE beamline at MAX IV Laboratory has recently commissioned its Fourier Transform Infrared Spectroscopy (FTIR) setup. Using an IRRAS (Infrared Reflection Absorption Spectroscopy) geometry, HIPPIE allows simultaneous vibrational and photoemission spectroscopy in the Ambient Pressure (AP) reaction cell. Using variable polarisation or using polarisation modulation to identify or suppress gas phase spectral contributions, IRRAS can provide a surface sensitive probe of adsorbates. The vibrational modes of surface species can be used as a fingerprint of surface species, which can sometimes be difficult to identify with any certainty using XPS alone. Therefore this multimodal approach of combining AP-XPS and AP-IRRAS promises to provide significantly more information regarding surface chemistry under reaction conditions than either method can separately.

This talk will primarily introduce the IRRAS method to those in the AP-XPS community who are new to vibrational spectroscopy, focusing on the value it can add to typical AP-XPS experiments. This is becoming particularly topical due to several existing and upcoming instruments that incorporate AP-XPS and AP-IRRAS, both using lab sources and synchrotron radiation. We will introduce the setup at HIPPIE, which is now available to general users, including discussion of its capabilities, limitations and future possibilities.

The above discussion will draw heavily on a case study: the interaction of CO with Cu(111) and Cu(211) surfaces under oxidation conditions. Time-resolved AP-IRRAS and AP-XPS measurements at HIPPIE were used to examine surface species that form, highlighting how the assignment of reaction intermediates can be aided using both methods simultaneously. This experiment additionally compares how the surfaces behave with and without being alloyed with Sn.

if "Other", please specify:

I apply for a travel grant

No

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Track Classification: Technical developments