Surface Chemistry and NAP-XPS: new tools and new paradigms

Synchrotron SOLEIL, December 10th-12th 2014

X-ray Photoemission Spectroscopy (XPS) is a powerful tool for the investigation of surfaces. Due to the strong scattering of photoelectrons by gas molecules it has been mostly used under ultra-high vacuum conditions (pressure <10-9 mbar), making it difficult to conduct investigations of surfaces under real-world conditions (i.e. in the presence of gases, and possibly liquids), such as is the case of interfacial chemical reactions in catalysis, chemical vapor deposition, electrochemistry and environmental chemistry.

A considerable breakthrough was the construction of a new type of photoemission spectrometer capable of operating at near ambient pressure (20 mbar, NAP-XPS). Initiated and developed at LBNL in Berkeley, NAP-XPS has already provided remarkable results in the field of environmental chemistry and catalysis.

Since January 2013, SOLEIL hosts the first machine of this type in France. The installation is managed by a group of researchers from the Université Pierre et Marie Curie (Sorbonne Universités, Paris). This technique opens entirely new avenues for measurements of surfaces using photoelectron spectroscopy. Concomitantly with this deep renewal of the XPS tool, we assist to a paradigmatic shift in the photoemission studies from classical ultra-high vacuum surface science examined statically towards model systems under ambient conditions with an emphasis on the dynamics.
It is thus time to review the present status, the latest developments and future prospects of NAP-XPS in the field of surface chemistry, covering both state-of-the-art experimental and theoretical aspects.

The dedicated workshop “Surface chemistry and Near-Ambient Pressure Photoemission: new tools and new paradigms” will take place at SOLEIL, the French National synchrotron source, on December 10^{th}-12^{th}, 2014.
The main objectives of the workshop are the following: first take a snapshot of this fast developing field, second examine how this technique combines with theoretical approaches, and third popularize the NAP-XPS technique among surface chemists and physical chemists.

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