

ELECTRONIC AND GEOMETRIC STRUCTURE OF MATTER PROBED IN-SITU BY MEANS OF X-RAY SPECTROSCOPY TECHNIQUES

J. Szlachetko*

Paul Scherrer Institut, 5232 Villigen PSI, Switzerland

** e-mail: Jakub.Szlachetko@psi.ch*

The study of electronic structure of matter at in situ conditions is a challenging task due to the often extreme sample conditions, sample complexity and low chemical sensitivity to the element of interest. The available techniques are usually too slow or insensitive to probe intermediates or complexes with low concentrations. X-rays based techniques are an ideal tool for the in-situ study because of their penetration properties, chemical specificity and sensitivity. X-ray absorption and emission spectroscopy (XAS/XES) or their combination, resonant inelastic x-ray spectroscopy (RIXS), allows for accurate mapping of local electronic and geometric structures.

I will review recent developments in in-situ XAS/XES techniques. Quick-RIXS or high energy resolution off-resonant spectroscopy (HEROS), were employed to follow chemical reactions in nanomaterials. I will discuss the application of valence-to-core (v2c) RIXS to determine electronic structure of metal-site together with application to micro-imaging spectroscopy. Finally, the application of XES/XAS techniques at x-ray free electron sources will be discussed and preliminary results from experiment at LCLS will be presented.