X-ray Microscopy Techniques

Julie Villanova[1]
[1] *ESRF, Grenoble France*

Presentation type: Tutorial Lecture **Presentation time:** 11:30-12:30

X-ray microscopy covers a range of techniques that enable the imaging of samples in 2D and 3D using X-ray beams, providing information on their microstructure and chemical composition with spatial resolutions ranging from the micrometer to the sub-micrometer scale. This tutorial will introduce the different existing experimental setups and the main techniques used for X-ray microscopy.

The tutorial will focus particularly on synchrotron hard X-ray full-field 3D nano-imaging, including recent developments in the field that are pushing the limits of spatial and temporal resolution, enabling increasingly detailed characterization of complex materials. The principles and specific features of the main approaches used for 3D X-ray nano-imaging, as well as the challenges associated with sample preparation, data acquisition, and image reconstruction will be discussed. A dedicated section will focus on in situ and operando studies. Each case will be illustrated with applications mainly related to materials science.

Finally, particular emphasis will be placed on the correlation of X-ray full-field nano-imaging with complementary 2D and 3D nano-analysis techniques, as combining structural, morphological, and chemical information at different length scales can provide a more comprehensive understanding of heterogeneous and complex materials.