

Modern X-ray scattering methods for studying functional materials

This mini-colloquium focuses on the use of hard X-rays to characterize functional materials from their synthesis up to their application. The enormous progress achieved in recent years both at 3rd generation synchrotrons as well as laboratory sources allows for studying the structural and physical properties of biomaterials, microelectronic components, and materials for energy amongst others. The employed techniques include the well-established methods used since decades, giving invaluable information, but also their local probe counterparts developed the last years. They cover fields ranging from crystallography over mechanical properties, piezoelectricity, catalysis, and optoelectronics to microelectronics, batteries, and biomineralization. *In-situ* and *operando* studies using X-rays profit both from the simpler sample preparation steps (less impact on the structure and/or properties of the material) and from the high penetration allowing for various sample environments – ranging from ultra-high vacuum, over gaseous atmospheres up to liquids. They grant access to important information in order to understand the behavior of systems which are not anymore model ones, but get close to the functioning device.

The covered topics are listed below:

- Synchrotron based high-resolution X-ray diffraction methods
- Methods and instrumentation in laboratory
- *In-situ* and *operando* techniques
- Micro- and nanofocused X-ray methods
- X-ray diffractometry
- X-ray absorption spectroscopy
- Micro-tomography
- Phase contrast imaging
- Small angle scattering
- Surface diffraction
- (Bragg) Coherent X-ray diffraction, ptychography
- X-ray free electron laser

This mini-colloquium is aimed to address the most recent progresses in the usage of synchrotron as well as laboratory X-ray sources to study the structural and physical properties of functional materials including industrial components, and will cover the latest developments and results of a vast number of topics addressed by this session. Contributions of young scientists and PhD students will be favored.

Invited speaker: Sylvain Ravy, Laboratoire de Physique des Solides (LPS), Université Paris-Sud