

An Introduction to X-ray Methods

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In this lecture I will introduce basic concepts of X-ray matter interaction, and the most important experimental techniques developed at Synchrotrons and X-ray Free Electron lasers. These include elastic and inelastic scattering and core-hole spectroscopies with focus on X-ray absorption and emission spectroscopy. Polarization dependent spectroscopies will be briefly introduced. Imaging modes exploiting density, strain or chemical contrast will also be illustrated. I will provide many examples of recent applications in different areas of current research, such as studies of atomic and electronic structure and dynamics of new functional materials for quantum technologies, climate and energy, environment and sustainability.