Mitigating Radiation Damage by Electrons and X-rays

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Electrons and x-rays are widely used for characterizing materials. With the advance in instrumentation and the ever increase in beam brightness and decrease in probe size for both electrons and x-rays, radiation damage becomes a major concern for structural analyses, not only for biological samples, but also for inorganic materials such as complex oxides. In this presentation we will review the complementarity of electrons and x-rays in structural characterization and their various operating modes in diffraction, imaging and spectroscopy and the associated mechanisms on radiation effects. We will discuss the elastic and inelastic scattering processes as well as the dose limited resolutions. The ways to mitigate the radiation damage including “diffraction before destruction” based on the ultrafast pump-probe approach will be discussed.

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