

3D Electron Diffraction on Nanocrystals: Crystal Structures and Beyond

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3D electron diffraction (3D ED) has emerged as a powerful technique transforming materials analysis at the nanoscale, enabling characterization of compounds that are inaccessible to conventional X-ray methods. Exploiting the unique properties of electron-matter interactions, crystal structures can be determined using crystals of tens to hundreds of nanometers in size. 3D ED has several additional advantages including discrimination of multiple phases within a mixture, localization of light atoms such as hydrogen, increased sensitivity to atomic charges and to the absolute structure of chiral molecules. Recent development of dedicated electron diffractometers have further increases the accessibility of the technique while improving experimental throughput.

Recent application cases of 3D ED on organic and inorganic materials are presented here. These include structure elucidation of compounds which were previously inaccessible to X-ray diffraction, absolute structure determination, modulization of ionization states directly from 3D ED data, accurate refinement of light atoms using quantum crystallographic approaches and specific strategies to handle beam-sensitive compounds.