Structural determination for crystalline/noncrystalline objects using coherent x-ray/electron diffraction microscopy

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Structural determination has played an imperative role in the evolution of modern science and technology. X-ray crystallography, first established in the early 20th century that obtains a globally average structure from a large number of unit cells, remains the only method to determine structures of materials at atomic resolution. The requirement of crystallization of the sample is not a practical approach for imaging defects of interest. Conventional electron imaging such as transmission electron microscopy may achieve atomic resolution; it is, however, difficult to perform analysis when samples are polycrystalline or too thick to deliver correct phase/density information. With the advance of coherent sources, a novel approach named coherent diffraction imaging (CDI) becomes extremely popular since no crystal structure is needed to obtain sample images. In this talk, I will introduce the concept of diffraction and the current application of several coherent x-ray/electron diffraction imaging techniques.