

## **Probing Micro Nano and Atomic Structures of Material with Synchrotron X-rays**

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Synchrotron radiation provides high intensity photons covering wide range of energies from infrared to x-ray. High intensity x-rays from a synchrotron light source is particularly useful for multi-level structural studies of various types of material. Micro structures can be probed using X-ray Tomographic Microscopy (XTM) technique, which utilization of synchrotron x-ray enables high resolution 3-dimensional x-ray images of the sample. In nano scale synchrotron Small Angle X-ray Scattering (SAXS) is one of the important techniques used to investigate material structures. SAXS can give valuable information ranging from shape and size distribution of nano particles and macro molecules to molecular arrangement in polymeric materials. Combining with an efficient optimization code, SAXS data can be used to model molecular arrangement and nano structures of wide range of systems. With the same instrument, synchrotron Wide Angle X-ray Scattering (WAXS) gives atomic scale information related to crystalline or semi-crystalline structures in materials, soft matter and biological samples. Simultaneous SAXS/WAXS setup at a synchrotron beamline can therefore yield structural information from nano to atomic scale in a single measurement. Combining XTM, SAXS/WAXS can therefore give structural information covering micro nano and atomic scale. Flexibility of synchrotron experimental station also enables various in-situ studies in which dynamic structural changes can be probed.