Overview of X-ray Imaging at NSLS-II

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There have been renewed interests and excitement in the scientific community on x-ray imaging in the past couple of decades. This is primarily due to the emerging opportunities brought about by the availability of three generations of much brighter synchrotron x-ray sources that have led to new x-ray imaging modalities, the substantial advances in x-ray imaging lenses and other optics leading to increasingly higher spatial resolutions to be achieved, and the remarkable growth in digital imaging detectors and computing power that has led to efficient image processing and reconstruction. The prospects of future coherent x-ray sources have brought even more enthusiasm in the community about the potentials of coherence-based x-ray imaging applications.

In addition to the technical advances, there exist genuine scientific interests in the society. As material scientists and biologists focus more attentions on structure-function correlations, structural imaging at the functional level on nonperiodic heterogeneous materials has become increasingly more important. For biological systems, imaging at the cellular level is of critical importance in the post-genomic era as we try to determine the functions of genes and gene products identified as a result of modern molecular biology techniques. For materials science, structural information at the nanometer-scale on real-world heterogeneous samples provides the critical missing link between atomic-scale structures and macroscopic materials properties. In addition, through time-resolved and high-speed x-ray imaging, intriguing opportunities exist to observe *in situ* the evolution of processes in these complex systems.

In this talk, I will discuss through examples the recent advances in x-ray imaging applications at modern synchrotron sources. I will introduce the National Synchrotron Light Source II (NSLS-II) which is the newest synchrotron facility under construction in the US. NSLS-II has been designed and optimized for ultralow emittance which offers excellent opportunities for scientific applications using nanoprobes and coherent imaging. I will discuss the current plans for beamline development process with emphasis on imaging applications.