Abstract for the 56th Annual Conference on Applications of X-ray Analysis
(Denver X-ray Conference, 30 July – 3 August 2007)

Combining 2D and point detectors for rapid and high-resolution high-energy x-ray diffraction of powders and single crystals in multiple sample environments

Yang Ren

X-Ray Science Division/XOR, Argonne National Laboratory, Argonne, IL 60439

The availability of synchrotron photons generated in high-flux and with energies much greater than 60 keV has significantly advanced the field of materials research because of the great penetration and low absorption of high-energy x-rays. Obtaining high angular resolution for high-energy x-ray scattering provides still further research opportunities, especially in the study of bulk samples for both fundamental research and practical applications. Here we present a user facility, at the APS high-energy x-ray beamline 11-ID-C, where we combine a 2D image plate and high-resolution detection (including a point detector and an analyzer) for both rapid and high-resolution x-ray diffraction studies. Both powder and single crystal samples can be studied under a variety of sample environments. Use of synchrotron x-rays with a photon energy of 115 keV provides two advantages: a small scattering angle and a high penetration length. This allows us to study structural changes of materials in confined and complex sample environments with combined tunable external parameters (for example, combinations of temperature, pressure, stress, magnetic and electric fields). We will present the technical details and scientific research opportunities for this facility. Some recent results obtained with this instrument in different research areas, ranging from the fundamental study of correlated electron systems to in-situ characterization of applied materials, will be presented.

Use of the Advanced Photon Source was supported by the U. S. Department of Energy, Office of Science, Office of Basic Energy Sciences, under Contract No. DE-AC02-CH11357.