

Inelastic and Nuclear Resonant X-ray Scattering at the Advanced Photon Source (Sectors 3ID and 30ID)

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Sector 3ID and 30ID beamlines at the Advanced Photon Source (APS) have unique capabilities with two research programs, nuclear resonant scattering (NRS) and momentum resolved high resolution X-ray inelastic scattering (HERIX). These techniques can be used to study sound velocity, thermal vibrational and thermal dynamical properties, isotope fractionation, spin, valence, magnetic and superconducting properties of materials. Both techniques have been intensively explored by COMPRES members during the last decade.

Over the years, we have developed various capabilities of sample environmental conditions, such as high pressure (multi-Mbar), high temperature (~5000 K), low temperature (4 K), and high magnetic field (7T), and combinations of these conditions. Furthermore, we have implemented both on-line pressure application and readout system, and off-line Raman system, for the convenience of the high pressure research activities. X-ray diffraction capabilities have been integrated with both the NRS and the HERIX for in situ structure and pressure determination. As part of the COMPRES facility, a conventional Mössbauer laboratory has been routinely used for sample characterization and studies at ambient/high pressure and low temperatures.

There are plans to upgrade some of the capabilities within the APS-U project. Among them, development of new focusing system to reach 1 micron size beams, development of 0.6 meV resolution monochromator for Fe nuclear resonance, and relocation of the high pressure set-up currently in Sector 3-ID-B station to 3-ID-C station.