

Large volume press program at 16-BM-B: experimentally linking atomic structure and emergent macroscopic properties at high pressures and temperatures

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The experimental beamline 16-BM-B of the Advanced Photon Source, Argonne National Laboratory has a set of established capabilities for comprehensive high-pressure-temperature x-ray studies using a large volume press. Availability of a large sample volume enables multiple experiment types that are not feasible with small-volume devices like the diamond anvil cell. The larger volume allows for the in-situ investigation of the relationship between the atomic structure and the emergent macroscopic properties at high pressure (P) and high temperature (T) conditions. The beamline is equipped with a Paris-Edinburgh (PE) press, integrated with a multitude of x-ray techniques and other electrical, optical, and ultrasonic techniques for in-situ synthesis and characterization at high P-T conditions. The established characterization techniques include energy-dispersive x-ray diffraction, liquid/amorphous atomic structure factor determination, ultrasound echo, falling sphere viscometry, monochromatic x-ray absorption scanning, phase contrast radiography, computed tomography, and specialty sample cells with electrical probes. New technical developments and scientific examples will also be presented.