

STUDYING EARTH MATERIALS AT HIGH P-T: RECENT EXPERIMENTS AT THE ADVANCED PHOTON SOURCE WITH DIAMOND CELLS

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While ultrahigh pressures and temperatures are generated in the diamond anvil cell (DAC), the achievement is at the expense of reducing sample size. To improve the accuracy of the experimentally determined quantities, substantial efforts are made at the GSECARS sector at the Advanced Photon Source (APS) to have characterization capabilities with high spatial resolution and to reduce the P-T gradients in sampling volume in DAC. The high brilliance synchrotron radiation allows to control x-ray beam size to 1-10 micron range, yet still with sufficient photon flux, to perform x-ray measurements. A newly developed laser heating system dramatically reduces the temperature gradient in sampling volume for in situ high P-T experiments. Besides using the diamond anvil as the x-ray detecting window, window materials have been extended to x-ray transparent gaskets, such as high strength beryllium and amorphous boron. This allows diffraction geometry in the radial directions in addition to the axial geometry through diamond anvils, and gains accesses to lower energies (~4 keV) than that with diamond anvil (~10 keV) for a variety of x-ray spectroscopic measurements. Recent experiments will be summarized and discussed.