High temperature, high pressure structural explorations on beamline I15 at Diamond Light Source

Christine M. Beavers, Annette Kleppe, Dominic Daisenberger, Simone Anzellini, Allan Ross

The extreme conditions beamline at Diamond Light Source, I15, offers X-ray characteristics and high pressure capabilities which are attractive to Earth scientists. I15 receives an X-ray continuum from a superconducting wiggler, with available monochromatic energies ranging from 20 to 80 keV. Multiple X-ray spot sizes are available, with a 5 x 9 micron spot paired with the laser heating system endstation.

An array of tools is available to facilitate high pressure experiments using several types of diamond anvil cells, including a suite of microscopes, a spark-erosion machine, a micromanipulator for sample preparation and loading, ruby fluorescence and Raman spectrometers, and a high pressure gas loader. For those who require lower high pressures, from 0-3000 bar, we collaborate with I22 (SAXS-WAXS) to use their p-jump cell, which is excellent for cyclic pressure cycling of soft materials.

In addition to the laser heating, other DAC heating methods are available, including resistively heated cells. A recent development is the I15 internally heated cell, which is an in-house design, modelled after the Basset hydrothermal cell. This presentation will introduce these available capabilities, some science examples as well as the beamline itself.