

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

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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 Bassett hydrothermal cell. This presentation will introduce these available capabilities, some science examples as well as the beamline itself.