

High-pressure total scattering at ISIS

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When it comes to non-ambient sample conditions, pressure is unrivalled as a thermodynamic tool. Pressures of 10 GPa (and above) are routinely achievable – this is roughly 6 orders of magnitude greater than ambient pressure, compared with our current ability to vary temperature by approximately 1-2 orders of magnitude. At the ISIS neutron facility, pressure is delivered using the Paris-Edinburgh press – a ‘lightweight’ large-volume device that is capable of delivering up to 28 GPa.¹

To date, the majority of neutron total scattering experiments have been performed under ambient or variable-temperature conditions; relatively little work has been carried out at hydrostatic pressure due to difficulties in detangling the scattering contributions from the pressure-transmitting fluid. However, several non-hydrostatic pressure studies have been carried out on amorphous materials, but more recently the technique has been extended to crystalline solids.²⁻⁴

This talk will present some of the history, recent advances and planned future directions for total scattering at pressure, both on PEARL – the dedicated high pressure diffractometer, and other ISIS instruments, as well as providing a brief overview of the pressure capabilities available.⁵

References

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