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Advanced Sample Environment Support for Neutron Instruments at the Bragg Institute, ANSTO.

Over the last few years a number of advancements have been made in sample environments available to scientists visiting the Neutron Beam Facility run by the Bragg institute at ANSTO (Lucas Heights). Conventional sample environment equipment allows experiments to be carried out from 35mK to 1700K, magnetic fields up to 12T and electric fields up to 10kV. These extremes are not available on all neutron instruments nor with one piece of equipment. However combinations of temperature, magnetic and electric fields are also possible. These conventional sample environments will not be covered here. This presentation will outline advances made in the gas handling, vapour delivery, differential scanning calorimetry (DSC) and spectroscopy at extreme temperatures all carried out simultaneously with neutron data collection. Some examples of the complimentary data collected are also presented.

Our automated gas handling system allows gas mixing (up to 4 gases), dosing (volumetric Sievert analysis) up to 200Bar, gas flow and molecular analysis with a dedicated mass spectrometer for kinetics investigations. The Hiden Isochema system is based on their commercial IMI system with the standard reaction chamber removed and replaced by thermalised capillary lines to allow the gas delivery to a sample reactor placed within a cryostat or furnace on the sample stage of our neutron instruments. Two options are available for vapour delivery. For samples that do not outgas a static system can be used where computer controlled valves control the vapour pressure. One valve is used to lower the pressure using a turbo pump and the second one to allow the vapour from the reservoir to increase the vapour pressure. Any non-corrosive liquid can be used in this system. The second vapour system, dynamically controls the vapour and dry gas flow allowing mixing of two vapours and a dry stream of gas or the recirculation of a saturated vapour through a sample reactor

The DSC system is based on A Mettler Toledo model DSC1. The furnace has been moved to allow the passage of the neutron beam and Bragg designed crucibles are used to allow scattering experiments to be carried out while DSC data are collected. Quartz and Aluminium crucibles are available and temperature range of 550C to -100C is achievable

Using Ocean Optics spectrometer equipment we have successfully carried out NIR spectroscopy down to 4K while collecting Neutron diffraction data. The use a standard NIR reflection probe and modification of the cryostat sample stick allows the probe to be introduced into the cryostat. A second spectrometer is available for UV-Vis spectroscopy and can be used in a similar method. These spectrometers are also available for use on other scattering instruments over a limited temperature range.

For more information on sample environments and how to book beam time at Bragg Institute please visit <http://www.ansto.gov.au/ResearchHub/Bragg/index.htm>

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