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Wide angle neutron polarization analysis time of flight spectroscopy at ISIS

In recent years, polarised neutron spectroscopy on multi-detector spectrometers has become possible with the advent of wide-angle neutron spin analysers, either using polarizing supermirror arrays (e.g. D007 (ILL), HYSPEC (SNS)) or ^3He spin-filters (LET (ISIS), PASTIS (ILL)). Wide-angle neutron polarization analysis is particularly useful for studying materials with short-range or non-crystalline order. Most commonly, it has been employed to separate magnetic scattering in disordered magnetic materials from nuclear scattering using XYZ polarization analysis developed by Schärpf [1] in the mid-80s. At the same time, it was realised that polarized neutrons could also be employed in the study of soft-matter and biological materials due to their ability to distinguish single-particle dynamics (such as diffusion) from co-operative correlated motions via the separated coherent and incoherent neutron cross-sections in hydrogenous materials.

In this webinar I will introduce the technique of uniaxial polarization analysis and its application to high resolution spectroscopy (QENS) studies using LET at ISIS, and on the proposed SHERPA spectrometer. Since neutron polarization experiments always come with a major flux and counting-rate penalty, I'll discuss when (and when not) polarized neutrons are really necessary in QENS measurements, using examples from LET. Future prospects for high-resolution magnetic spectroscopy with polarization analysis will also be discussed.

[1] O Schärpf and H Capellmann (1993). The XYZ-Difference Method with Polarized Neutrons and the Separation of Coherent, Spin Incoherent, and Magnetic Scattering Cross Sections in a Multidetector. *Physica Status Solidi (A)*, 135(2), 359–379. <https://doi.org/10.1002/pssa.2211350204>

Session

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