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Ferromagnetic Resonance-Polarised Neutron Reflectometry

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Magnetisation dynamics is a growing area of materials characterisation in thin film magnetism and is particular of interest for magnetic exchange spring systems which consist of alternating thin hard and soft magnetic layers provide a great potential in applications such as (i) permanent magnets and (ii) magnetic data storage and spintronic devices.

There is significant enthusiasm to develop in-situ type sample environments to incorporate magnetisation dynamics such as ferromagnetic resonance with other means of probing the sample. Current methods are limited to X-ray magnetic circular dichroism (XMCD) which allows for element-selective hysteresis loops and dynamic measurements to be performed using XMCD for the magnetic contrast. However, this technique yields the average response of the material layer for a given element. There is a wealth of knowledge which can be obtained by combining the technique with Polarised Neutron Reflectometry (PNR). This would allow for the magnetisation direction and magnitude to be determined as a function of depth through the material which in turn provides detail on how the magnetisation precession as a function of depth changes, which is key in understanding multi-layered structures, and how the anisotropy of one layer can influence the second in particular at the boundaries and interfaces where currently this information cannot be obtained.

This talk highlights the recent ferromagnetic resonance developments for offline laboratory work and in-situ with neutron beamtime studies.

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