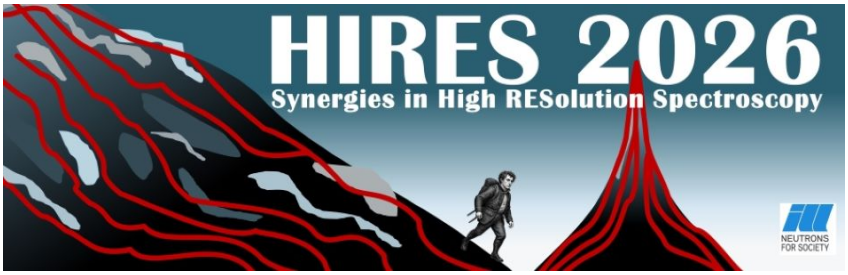

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Phonon–Lattice Coupling in Mn-Doped II–VI Nanostructures: A Neutron-Ready Platform

Mn-doped II–VI nanostructures provide a clean playground to study how lattice vibrations reshape electronic and spin states. In our recent work on 0D Mn-doped $(CdSe)_{13}$ clusters and 2D Mn-doped $CdSe(en)_{0.5}$ nanosheets, we observe giant magnetic moments and room-temperature giant Zeeman splitting, accompanied by strain-sensitive LO phonons and strong magneto-optical responses. Microstrain domains, ligand-induced distortions, and symmetry breaking in these crystals suggest that specific phonon modes modulate Mn^{2+} zero-field splitting and sp–d exchange, opening phonon-assisted spin-flip channels.

So far our picture comes from Raman, PL, EPR, and X-ray probes, which are effectively limited to $Q \approx 0$. The next step is to resolve how these strain-engineered phonons evolve across momentum and length scales using neutron spectroscopy (INS, NSE) and total scattering/PDF. We will outline our materials platform, key phonon signatures, and open questions on spin–phonon coupling, and we are actively seeking collaborators with neutron-scattering expertise to design and execute joint experiments on these nanostructures at large-scale facilities.

Session

Materials Science

Primary authors: Dr NARAYANAM, Nagaraju (Natinal Taiwan Normal University); LIU, Yi-Hsin (Natinal Taiwan Normal University)

Presenters: Dr NARAYANAM, Nagaraju (Natinal Taiwan Normal University); LIU, Yi-Hsin (Natinal Taiwan Normal University)

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