

Study of Magnetoelectrics using Soft X-ray Scattering

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One of the goals of spintronics research is to develop materials that allow electric field control of magnetisation. Such materials have the potential to decrease the energy cost associated with writing magnetic data. Materials that have both ferroelectric and ferromagnetic order parameters, so called multiferroics, offer some hope of achieving this. Polarisation dependent soft X-ray scattering has been used to study an antiferromagnetic phase in the multiferroic $\text{Co}_{0.15}\text{Mn}_{0.85}\text{WO}_4$. Non-collinear moments of the Co and Mn atoms have been attributed to the different single ion anisotropies of both elements. In addition to multiferroic crystals, electric control of magnetisation can be achieved by combining ferroelectrics and ferromagnets in composites or thin films. From this perspective, a thin film of FeRh has been grown on a substrate of BaTiO_3 . The antiferromagnetic to ferromagnetic phase transition in the FeRh is known to be dependent on strain which can be altered by the substrate. By applying an electric field to the ferroelectric substrate we have been able to influence significantly the magnetisation in the FeRh layer. Preliminary results from coherent soft X-ray scattering and conventional magnetometry will be shown.