A High Pressure X-ray Diffraction Study of $A_2Mo_3O_8$ (A^{2+} = Fe, Mn, Co): preliminary results.

Holly McPhillips

The polar hexagonal 3*d* transition metal molybdenum layered oxides (space group no. 186, $P6_3mc$), $A_2Mo_3O_8$ (A^{2+} = Fe, Mn, Co, Ni, Zn, Mg), have received extensive attention in the literature in recent years, exhibiting potential applications in multiple-state memory storage devices, low-power spintronics and optical sensors. This is due to magnetoelectric coupling, where ferroelectricity and magnetism coexist below a magnetic ordering temperature, T_N. Depending on the identity of A^{2+}, this temperature range spans T_N = 40 – 60 K, and various types of spin structures within the $A_2Mo_3O_8$ family can be realised, including antiferromagnetic, ferrimagnetic, and spin-flopped plane ordered states. Currently, transforming between different spin structures has been demonstrated through chemical doping and applied magnetic field studies. However, applied pressure is typically another parameter that can be used to investigate the structure and electronic and magnetic behaviour of layered oxides. Such an investigation has not been carried out for the $A_2Mo_3O_8$ family, which may unlock some further information on the magnetoelectric coupling mechanism within the family. Layered oxides A^{2+} = Fe, Mn, Co were investigated up to 5 GPa using room-temperature x-ray diffraction on the I15 beamline at Diamond Light Source. This talk will give an overview of the experimental set-up, a preliminary analysis of the results collected for the materials and what a future investigation may entail. This work is my last Thesis chapter, hence preliminary results.