



Contribution ID: 65

Type: Poster

Correlating the effects of non-magnetic doping with structural anomaly in the multiferroic material Cu_2OSeO_3

Unconventional topological spin structures such as chiral spin systems offer a plethora of fascinating phenomena for fundamental research and future technological applications. Cu_2OSeO_3 is an insulating multiferroic material that was shown to host skyrmions under specific conditions. It possesses a 3D Kagome lattice of Cu^{2+} sites, such that a triangular network lattice connects the magnetic ions. Although Kagome lattices are generally associated with hosting frustrated magnetic structures, Cu_2OSeO_3 lacks any significant frustration due to both ferromagnetic and antiferromagnetic superexchange interactions being present, as satisfied by a 3-up 1-down ferrimagnetic arrangement. The lack of inversion symmetry in the corner shared O-Cu4 tetrahedra that make up the 3D Kagome lattice results in an appreciable Dzyaloshinskii-Moriya interaction between Cu^{2+} sites; this competes with ferromagnetic/antiferromagnetic interactions leading spin canting that underpins the formation of helical/conical spin textures. While no change in the overall cubic symmetry has been observed alongside the formation of the above magnetic phases, low-temperature powder and single crystal diffraction data (lab, synchrotron and neutron) on pure and Te-doped Cu_2OSeO_3 indicate an anomalous trend in Cu-Cu bond distances below room temperature. Inverse trends in the Cu(1)-Cu(2) and Cu(1)-Cu(2) distances between the 'strongly' and 'weakly' interacting O-Cu4 tetrahedra with the distance decreasing and increasing, respectively. This is reminiscent of distortions found in 2D breathing AFM Kagome lattices, which trend towards trimers of magnetic sites sitting on a triangular lattice. The strongest distortion of the Cu-Kagome lattice correlates with the temperature with which the magnetic skyrmions are stable (56 - 58 K).

Level of Expertise

Student

Presenter Gender

Woman

Pronouns

She/Her

Do you intend to attend UM2022

In person - Melbourne

Students Only - if available would you be interested in student travel funding

Yes

Students Only –Do you wish to take part in the Student Poster Slam

Yes

Terms and conditions (Please confirm that you have read all the requirements and agree to the conditions)

Yes

Primary authors: ROV, Rosanna (University of Auckland); YICK, Samuel (UNSW and ANSTO); SOEHNEL, Tilo (The University of Auckland)

Presenter: ROV, Rosanna (University of Auckland)

Session Classification: Poster

Track Classification: Chemistry, Catalyses & Soft Matter