

Poster Presentation

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Structural and Magnetic Chirality of Cu_2OSeO_3

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We determine the chirality of the magnetic and crystal structures, respectively, for the magnetoelectric insulator Cu_2OSeO_3 using small-angle diffraction of polarized neutrons and resonant contribution to X-ray single crystal diffraction of synchrotron radiation. This compound crystallizes in the $P2_13$ space group similar to other chiral but metallic magnets, such as MnSi , MnGe , $\text{MnSi}_{1-x}\text{Ge}_x$, $\text{Fe}_{1-x}\text{Co}_x\text{Si}$, $\text{Mn}_{1-x}\text{Fe}_x\text{Si}$, $\text{Mn}_{1-x}\text{Co}_x\text{Si}$, FeGe , $\text{Mn}_{1-x}\text{Fe}_x\text{Ge}$. It has recently been shown that the structural and magnetic chiralities for metallic helimagnets are linked to each other [1], also in the so-called skyrmion phase [2]. Here we measure the spin chirality by comparing neutron scattering maps from Cu_2OSeO_3 with the reference MnSi , which has left-handed magnetic spiral and absolute crystal structure denoted as left-handed [1]. Similar to the reference MnSi system, the crystallographic chirality of Cu_2OSeO_3 is fixed on the basis of absolute structure determination taking into account the refinement of the Flack parameter. We find that the crystal and magnetic structures of Cu_2OSeO_3 have the same chirality. The similar relationship is found for MnSi , $\text{Mn}_{1-x}\text{Fe}_x\text{Si}$, MnGe , while FeGe and $\text{Fe}_{1-x}\text{Co}_x\text{Si}$ always show the opposite chiral correlation between magnetic and crystal structures. Notably, the relationship between two chiralities for Cu_2OSeO_3 found in the experiment is opposite to that proposed from recent theoretical calculations [3], thus calling for a revision of the theory of possible microscopic mechanisms contributing to the phenomenological antisymmetric magneto-lattice coupling.

[1] S.V. Grigoriev et al., *Phys. Rev. Lett.* 110 (2013) 207201, [2] D. Morikawa et al., *Phys. Rev. B* 88 (2013) 024408, [3] V. Chizhikov et al., *arXiv:1305.5382* (2013)

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