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, $MnSi_{1-x}Ge_x$, $Fe_{1-x}Co_xSi$, $Mn_{1-x}Fe_xSi$, $Mn_{1-x}Co_xSi$, FeGe, $Mn_{1-x}Fe_xGe$. 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, $Mn_{1-x}Fe_xSi$, MnGe, while FeGe and $Fe_{1-x}Co_xSi$ 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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