Poster Presentation

MS105.P01

Structural and Magnetic Chirality of Cu₂OSeO₃

V. Dyadkin¹, D. Chernyshov¹
¹Swiss-Norwegian Beamlines at the ESRF, Grenoble, France

We determine the chirality of the magnetic and crystal structures, respectively, for the magnetoelectric insulator Cu₂OSeO₃ using small-angle diffraction of polarized neutrons and resonant contribution to X-ray single crystal diffraction of synchrotron radiation. This compound crystallizes in the P2₁3 space group similar to other chiral but metallic magnets, such as MnSi, MnGe, MnSi₁₋ₓGeₓ, Fe₁₋ₓCoₓSi, Mn₁₋ₓCoₓSi, FeGe, Mn₁₋ₓFeₓGe. 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 Cu₂OSeO₃ 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 Cu₂OSeO₃ 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 Cu₂OSeO₃ have the same chirality. The similar relationship is found for MnSi, Mn₁₋ₓFeₓSi, MnGe, while FeGe and Fe₁₋ₓCoₓSi always show the opposite chiral correlation between magnetic and crystal structures. Notably, the relationship between two chiralities for Cu₂OSeO₃ 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.


Keywords: Chirality, Absolute structure, Magnetoelectric