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Single crystal investigations on the new multiferroic material $\text{LiFe}(\text{WO}_4)_2$

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Multiferroic materials attract much interest during the last decades as the coupling of electric and magnetic ordering offers an application potential for future memory devices or new type of sensors. The most prominent mechanism for multiferroicity is given by the inverse Dzyaloshinskii-Moriya interaction, where a spiral magnetic structure induces a shift of non-magnetic ligand ions and hence a ferroelectric polarization, which can be controlled by the conjugate field of both ferroic ordering parameters. Recently, experiments on a powdered sample of $\text{LiFe}(\text{WO}_4)_2$ revealed two subsequent magnetic phases, of which the lower one exhibits multiferroic behavior [1]. Beneath MnWO_4 , $\text{LiFe}(\text{WO}_4)_2$ is thus the second multiferroic system in this family. Here we report on our single crystal studies on $\text{LiFe}(\text{WO}_4)_2$ and on the respective structural and magnetic refinements. Neutron diffraction experiments revealed the magnetic structure of both magnetic phases, where first a spin-density wave and subsequently a chiral magnetic structure evolves. Moreover, polarization analysis on the cold three-axes spectrometer KOMPASS unambiguously proves the chiral magnetic phase and shows that even without an external applied electric field a preferred handedness occurs.

[1] Liu et al. Phys. Rev. B 95, 195134 (2017)

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