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Interplay between structural and magnetic chiralities in NiCo2TeO6

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NiCo2TeO6 crystallises in the R3 space group where the displacements of the O1/O2 oxygen atoms in the triangular plaquettes lead to left-handed and right-handed structural chiralities [1]. This compound is particularly interesting because an anomaly was observed in the dielectric susceptibility at TN suggesting the presence of magnetoelectric behaviour [2]. A long-range magnetic order (magnetic space group R3.1'(00ɣ)ts) develops below 52 K consisting of ferromagnetically coupled a-b layers of Ni2+ that rotate along c with an incommensurate propagation vector k = (0, 0, 0.211) [2]. It is not yet clear if the magnetic helix echoes the feature of two helices of opposite handedness where the globally preferred chirality emerges as a difference between the displacements or if it presents a single chirality. Therefore, we probed the structural and magnetic chiralities using polarized neutrons on the D3 diffractometer at the ILL, following the successful methodology from our previous work on a langasite compound [3]. We studied two NiCo2TeO6 single crystals, one of each structural chirality. Spherical neutron polarimetry and Schwinger scattering were exploited to deduce the magnetic and structural chiralities, respectively, while our complementary X-rays results yield information concerning the coupling of those two quantities. Our findings constitute an important step towards the understanding of the magnetoelectric properties of this compound.

[1] X. Wang et al., APL Meterials, 3(7) (2015) 076105.
[2] S. Skiadopoulou et al., Phys. Rev B, 101(1) (2020) 014429.
[3] N. Qureshi et al., Phys. Rev B, 102(4) (2020) 054417.

Primary authors: BEAUVOIS, Ketty (CEA Grenoble); QURESHI, Navid (Institut Laue Langevin)

Co-authors: BOMBARDI, Alessandro (Diamond Light Source); Dr VIBHAKAR, Anu (Diamond Light Source Didcot, UK); Dr WON, Choongjae (Laboratory for Pohang Emergent Materials and Max Planck POSTECH Center for Complex Phase Materials, Pohang Univ. of Science and Technology, Dept. Phys., Pohang, Korea.); Prof. CHEONG, Sang-Wook (Laboratory for Pohang Emergent Materials and Max Planck POSTECH Center for Complex Phase Materials, Pohang Univ. of Science and Technology, Dept. Phys., Pohang, Korea. Rutgers Center for Emergent Materials and Dept. Phys. and Astronomy, New Jersey, USA)

Presenter: BEAUVOIS, Ketty (CEA Grenoble)

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