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Structural and Magnetic Chirality In NiCo2TeO6

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ABSTRACT

The chiral nature of our immediate environment is obvious to us structurally and functionally, and it seems to be a key ingredient of life, yet it remains one of the most elusive properties to understand and investigate at the atomic length scale.
X-rays measure structural chirality via the interference of the anomalous scattering factor. This provides a tiny variation in the measured intensity, usually sufficient to distinguish between different enantiomers, whereas both non-resonant and resonant magnetic scattering can be used to assess inversion domains in non collinear magnetic structure via the helicity of the probe, see [1] and references therein. The case of neutrons is similar, with polarized neutrons able to assess magnetic chirality and inversion domains [1], whereas the tiny relativistic Schwinger term is the only cross section term to measure the structural chirality [1].
Here, we present a combined X-ray and polarized neutron scattering study on chiral, polar and magnetoelectric compound NiCo2TeO6[2,3]. This system adopts a structural arrangement derived from the corundum R3c of Al2O3, but the introduction of Co and Te at the Al site breaks the inversion and the c-glide symmetry, generating a ferri-chiral structural arrangements, with often both chirality present in the same crystal.
Using a similar methodology to the one adopted in the case of Ba3NbFe3Si2O14 [1], we determine the relation between the magnetic and structural chirality in this system.
A clear theoretical framework of the microscopic interactions driving the chirality of NiCo2TeO6 is still missing, but our experimental results provide a sound foundation to understand the origin of this phenomenon and to future application of the magnetoelectric properties of this system.
REFERENCES
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