



Contribution ID: 48 Contribution code: Chair: Sonia Francoual

Type: Oral

## Structural and Magnetic Chirality In NiCo<sub>2</sub>TeO<sub>6</sub>

Tuesday, 7 October 2025 14:40 (25 minutes)

A. Bombardi [1], N. Qureshi [2], A. Vibhakar [1], K. Beauvois [3], R. Scatena [1], F. Carneiro [1], C. J. Won [4] and S.-W. Cheong [5]

[1] Diamond Light Source, Harwell Science and Innovation Campus Didcot OX11 0DE, Oxfordshire, UK

[2] Institut Laue-Langevin, 71 avenue des Martyrs, CS 20156, 38042 Grenoble Cedex 9, France

[3] Université Grenoble Alpes, CEA, IRIG, MEM, MDN, 38000 Grenoble, France

[4] Laboratory for Pohang Emergent Materials and Max Planck POSTECH Center for Complex Phase Materials, Pohang Univ. of Science and Technology, Dept. Phys., Pohang, Korea

[5] Rutgers Center for Emergent Materials and Department of Physics and Astronomy, Rutgers University, Piscataway, NJ, 08854, USA

### 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 NiCo<sub>2</sub>TeO<sub>6</sub>[2,3]. This system adopts a structural arrangement derived from the corundum R3c of Al<sub>2</sub>O<sub>3</sub>, 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 Ba<sub>3</sub>NbFe<sub>3</sub>Si<sub>2</sub>O<sub>14</sub> [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 NiCo<sub>2</sub>TeO<sub>6</sub> 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

1. N. Qureshi et al. Phys. Rev. B 102, 054417 (2020).
2. X. Wang et al. APL Mater. 3, 076105 (2015).
3. N. Qureshi et al. to be submitted to Phys Rev B

**Primary authors:** BOMBARDI, Alessandro (Diamond Light Source); Dr VIBHAKAR, Anuradha (Diamond Light Source); Dr WON, C.J. (Pohang University); Dr CARNEIRO, Fellipe (Diamond Light Source); Dr BEAUVOIS, Ketty; Dr QURESHI, Navid (Institut Laue-Langevin); Dr SCATENA, Rebecca (Diamond Light Source); Prof. CHEONG, Sang-Wook (Rutgers University)

**Presenter:** BOMBARDI, Alessandro (Diamond Light Source)

**Session Classification:** Talks Tuesday Afternoon