Contribution ID: **12** Type: **Oral**

Tuning magnetoelectricity in a mixed-anisotropy antiferromagnet

Monday, 12 September 2022 18:05 (25 minutes)

The ability to control magnetic and electric properties is attractive for tailoring materials for devices, data storage and sensor technology. In magnetoelectric materials, these two degrees of freedom are closely linked and this makes them particularly interesting [1]. Here we study one such system, $LiNi_{1-x}Fe_xPO_4$, using magnetometry, polarized neutron diffraction, pyrocurrent measurements and Monte Carlo simulations. The parent compounds of this mixed system, $LiNiPO_4$ and $LiFePO_4$, possess mismatched magnetic anisotropies and we demonstrate that by random magnetic anisotropy mixing it is possible to tune the magnetic and magnetoelectric properties. Interestingly, the ordered moment in the ground state is rotated off the plane spanned by the easy axes of the parent compounds. Such behavior was previously theoretically predicted and our study provides the first clear experimental evidence for such phase. Most remarkably, as a consequence of the lower magnetic symmetry, additional magnetoelectric couplings are unlocked and enhanced in the system. Hence, our study shows that mixed-anisotropy magnetoelectric antiferromagnets represent a promising route with general applicability towards control of magnetoelectric properties, relying only on chemical randomness.

[1] W. Eerenstein, N. D. Mathur and J. F. Scott, *Nature* **442**, 759–765 (2006)

Primary author: Dr FOGH, Ellen (Laboratory for Quantum Magnetism, Institute of Physics, École Polytechnique Fédérale de Lausanne (EPFL), CH-1015 Lausanne, Switzerland)

Co-authors: Dr KLEMPKE, Bastian (Helmholtz-Zentrum Berlin fur Materialien und Energie, D-14109 Berlin, Germany); Dr NIEDERMAYER, Christof (Laboratory for Neutron Scattering and Imaging, Paul Scherrer Institute, Villigen CH-5232, Switzerland); Dr VAKNIN, David (mes Laboratory and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011); Dr CHRISTENSEN, Niels B. (Department of Physics, Technical University of Denmark, DK-2800 Kongens Lyngby, Denmark); Dr SYLJUÅSEN, Olav F. (Department of Physics, University of Oslo, P. O. Box 1048 Blindern, N-0316 Oslo, Norway); Dr BOURGES, Philippe (Laboratoire Léon Brillouin, CEA-CNRS, CEA-Saclay, F-91191 Gif-sur-Yvette, France); Dr TOFT-PETERSEN, Rasmus (European Spallation Source ERIC, P.O. Box 176, SE-221 00, Lund, Sweden)

Presenter: Dr FOGH, Ellen (Laboratory for Quantum Magnetism, Institute of Physics, École Polytechnique Fédérale de Lausanne (EPFL), CH-1015 Lausanne, Switzerland)

Session Classification: Session 1 : Materials Science 1