the mentioned database will help to show how representation analysis and superspace symmetry can be combined to achieve an optimal enumeration of possible physically-distinct incommensurate magnetic orderings and to obtain a detailed unambiguous rigorous characterization of magnetically modulated structures.

Keywords: incommensurate magnetic structures, supespace symmetry, magnetic symmetry

MS28-O2

Complex magnetic structure of the swedenborgite $CaBa(Co_3Fe)O_7$ derived by unpolarized neutron diffraction and spherical neutron polarimetry

Navid Qureshi[1], María Teresa Fernández-Díaz[1], Laurent Chapon[2], Anatoliy Senyshyn[3], Werner Schweika[4], Martin Valldor[5]

1. Institut Laue-Langevin, Grenoble, France
2. Diamond Light Source, Didcot, United Kingdom
3. Forschungs-Neutronenquelle Heinz Maier Leibnitz (FRM-II), Garching, Germany
4. Institut für Festkörperforschung, Forschungszentrum Jülich, Jülich, Germany
5. Leibniz Institute for Solid State and Materials Research, Dresden, Germany

email: qureshi@ill.fr

The magnetic swedenborgites, i.e. structural homologues to the hexagonal mineral $SbNaBe_4O_7$ (Refs. [1,2]), contain kagome layers with several different, similarly strong, competing spin interactions, which lead to a wide variety of ground states including chiral spin liquids), spin-glasses and long-range antiferromagnetic order. The slight structural distortions away from the hexagonal symmetry release the geometric frustration and the nature of the distortion determines the ground state. As the spins are Heisenberg-like, a Néel order is not expected unless a significant magnetic coupling between the kagome layers is at hand, which is mediated by triangular layers in-between. Here we present an extensive study on the orthorhombic compound $CaBa(Co_3Fe)O_7$ combining powder and single-crystal neutron diffraction as well as spherical neutron polarimetry (SNP). A detailed analysis of the possible irreducible representations and the magnetic structure factors in combination with the observed polarization matrices of special reflections gave clear indications concerning the magnetic symmetry. The complex situation with the presence of three structural twins and four magnetic domains (two orientational and two chiral domains) was tackled with the development of a unique software, Mag2Pol [3], which permits the refinement of a magnetic structure model including domain populations to integrated intensity and SNP data simultaneously. We could therefore derive an interesting magnetic structure of magnetic superspace symmetry P2'_1, which differs from any other member of the swedenborgite family, but which can be mapped onto the classical sqrt(3) x sqrt(3) structure of a kagome lattice. The resulting spin structure indicates an important interplay between the kagome and the triangular layers of the crystal structure.

References:

[1] Aminoff, G. (1924). Z. Kristallogr. 60, 262
[2] Aminoff, G. & Blix, R. (1933) Kgl. Sv. Vet. H. 11, 3
[3] N. Qureshi, arXiv:1801.08431.

Keywords: magnetic structure, neutron diffraction, spherical neutron polarimetry