

Complex multi-q magnetic order and multiferroicity in spinel GeFe₂O₄

Wednesday, 4 June 2025 14:30 (30 minutes)

As they often stabilize with complex non-collinear magnetic structures, frustrated magnets are potential candidates for type-II multiferroism, where both magnetic and electric orders appear at the same temperature and are strongly coupled [1]. In these materials, the proper understanding of the coupling between spin and charge degrees of freedom is a key to identify the microscopic mechanism at the origin of the multiferroic properties [2]. Here we focus on the normal cubic spinel GeFe₂O₄, crystallizing in the Fd-3m space group. In this compound, the Fe magnetic ions form a pyrochlore sublattice, consisting of a network of corner-sharing tetrahedra prone to magnetic frustration [3]. In this talk I will present our recent study combining experiments (single-crystal neutron diffraction and inelastic neutron scattering) with meticulous modeling of the experimental data. I will show how this complementary approach has been successful to evidence, in this system, a non-coplanar spin texture described by a combination of 6 symmetry-equivalent propagation vectors [4]. We will also see how this complex multi-q magnetic order plays a crucial role in the emergence of ferroelectric properties recently observed at the magnetic transition temperature [5].

[1] D. Khomskii, *Physics* **2**, 20 (2009).[↗](#)

[2] H. Katsura *et al.*, *Phys. Rev. Lett.* **95**, 057205 (2005); I. A. Sergienko & E. Dagotto, *Phys. Rev. B* **73**, 094434 (2006).[↗](#)

[3] M. D. Welch *et al.*, *Mineral. mag.* **65**, 441–444 (2001).[↗](#)

[4] L. Chaix *et al.*, *to be submitted to Phys. Rev. Lett.*[↗](#)

[5] E. Chan *et al.*, *in preparation.*

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Session Classification: Invited speakers