Contribution ID: **23** Type: **Talk**

Magnetic and orbital excitations in the multiferroic skyrmion host GaV4S8

Monday, 14 September 2015 11:50 (25 minutes)

The lacunar spinel GaV4S8 undergoes orbital ordering at 44 K and reveals a complex magnetic phase diagram below 13 K, including a ferromagnetic, cycloidal and Néel-type skyrmion lattice phase.[1] Skyrmions are topologically protected nano-scale spin vortices with fascinating physical properties and high potential for future data storage. Based on magnetic susceptibility, heat capacity and pyrocurrent measurements, all as function of temperature and magnetic field, we construct a detailed phase diagram and in addition, we provide a thorough study of the polar properties of GaV4S8, revealing that its orbitally ordered phase is ferroelectric with sizable polarization of ~ 1 μC/cm2. Moreover, spin-driven excess polarizations emerge in all magnetic phases; hence, GaV4S8 hosts three different multiferroic phases including the skyrmion lattice formed by ferroelectric spin vortices.[2] By taking into account the crystal symmetry and spin patterns of the magnetically ordered phases, exchange striction is identified as the main microscopic mechanism behind the spin-driven ferroelectric polarization in each multiferroic phase. The polar crystal structure of GaV4S8 is unique among the known skyrmion-lattice host materials and the ferroelectric SkL phase may be exploited for non-dissipative electric-field control of skyrmions.
In the second part of this talk we present detailed results using THz and coplanar waveguide (CPW) absorption spectroscopy. We find an intriguing relaxation dynamics in the THz range indicating the divergence of relaxation times coupled to the orbital dynamics and establishing an orbitally driven ferroelectric phase below the Jahn-Teller transition. In addition, using CPW absorption spectroscopy we study magnetic excitations of the skyrmion, the helical and the collinear spin phases.[3]

[1] I. Kézsmárki et al., arXiv: 1502.08049, unpublished, (2015)
[2] E. Ruff et al., arXiv: 1504.00309, unpublished, (2015)
[3] D. Ehlers et al., unpublished, (2015)

Primary author: Prof. LOIDL, Alois (University of Augsburg)

Co-authors: Mr EHLERS, Dieter (University of Augsburg); Mr STASINOPOULOS, Ioannis (TU Munich); Prof. KÉZSMÁRKI, Istvan (Budapest University of Technology and Economics); Dr LUNKENHEIMER, Peter (University of Augsburg); Dr TSURKAN, Vladimir (University of Augsburg); Mr WANG, Zhe (University of Augsburg)

Presenter: Prof. LOIDL, Alois (University of Augsburg)

Session Classification: Multiferroics and ferroelectrics

Track Classification: DyProSo2015 Main track