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EINLADUNG zum IFP-SEMINAR

Topological and helical spin structures in centrosymmetric perovskite-type oxides

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Host:	Andrei Pimenov
Termin:	Montag, 3. Februar 2020, 11:00 Uhr
Ort:	Institut für Festkörperphysik, TU Wien
	Wiedner Hauptstraße 8-10, 1040 Wien
	Seminarraum DC rot 07 (roter Bereich, 7. OG)

Abstract:

Topological spin texture consisting of multiple-q spin spiral is of great interest for novel quantum transport phenomena and spintronic functions. A recent interesting example is a magnetic skyrmion, which is a topologically stable spin texture discovered in noncentrosymmetric systems with Dzyaloshinskii-Moriya (DM) interaction [1]. A cubic perovskite $SrFeO_3$ is a promising candidate of the centrosymmetric compound hosting a novel type of topological spin texutre in the absence of the DM interaction. While the magnetic ground state has been believed to be a simple proper-screw-type spin order for long time, we have found that the magnetic phase diagram of $SrFeO_3$ hosts a rich variety of helimagnetic phases, two of which show novel topological helimagnetic orders [2].

In this seminar, after the brief review of our recent works, I will show the topologically nontrivial helimagnetic phases in the simple cubic perovskite $SrFeO_3$, which were discovered by small angle neutron scattering (SANS) measurements. We found that $SrFeO_3$ shows two kinds of multiple-q helimagnetic structures: an anisotropic double-q spin spiral and an isotropic quadruple-q spiral hosting a three-dimensional lattice of topological singularities [3]. As a related topic, our recent discoveries of novel helimagnetic phases in the perovskites $Sr_{1-x}Ba_xCoO_3$ [4] and $Sr_{1-x}Ca_xCoO_3$ [5] will be also presented. By magnetization measurements, the magnetic phase diagrams of $Sr_{1-x}Ba_xCoO_3$ and $Sr_{1-x}Ca_xCoO_3$ were established. As for $Sr_{1-x}Ba_xCoO_3$, the ferromagnetic order tends to be suppressed by the Ba substitution and eventually replaced by a helimagnetic state. Based on the first-principles calculations, the results will be discussed in terms of the competing magnetic order in the Co-O lattice. These results indicate that centrosymmetric perovskite-type transition-metal oxides obtained at high pressures are fruitful show cases for nontrivial helimagnetic phases.

[1] S. Mühlbauer *et al*., Science **323**, 915 (2009).
[2] S. Ishiwata *et al.*, Phys. Rev. B **84**, 054427 (2011).
[3] S. Ishiwata *et al.*, arXiv:1806.02309.
[4] H. Sakai, S.I. *et al*., Phys. Rev. Mater. **2**, 104412 (2018).
[5] T. Osaka, S.I. *et al*., Phys. Rev. B **95**, 224440 (2017).