MS98.O05

Magnetism and its interplay with lattice in the iron-based ladder compounds

Y. Nambu[1], T. Hawai[2], T. Sato[1], K. Ohgushi[2]

[1]Tohoku University, Institute of Multidisciplinary Research for Advanced Materials, Sendai, Japan, [2]University of Tokyo, Institute for Solid State Physics, Kashiwa, Japan

Since the discovery, research on iron-based superconductivity (SC) has become one of the main streams in condensed matter physics [1]. The interplay between structure, magnetism and SC is one of most intriguing subjects of this field. The common structural feature is the presence of square planar sheets of Fe atoms coordinated tetrahedrally by pnictogens or chalcogens. They have been, at the early stage, realized in the ZrCuSiAs (1111), ThCr2Si2 (122), anti-PbO (11) and Cu2Sb (111) structures. To gain further insight into the mechanism of the SC and variation of magnetic orders, investigation of Fe-based compounds with a separate spatial dimension is important. This is because the dimensionality should influence magnetism and can control itinerancy of electrons by changing Fermi surface topology. As spin ladders in copper oxides shed a new light on the mechanism of SC, a study on an analogue with ladder geometry among Fe-based compounds is highly desired. Here we report our recent studies of iron-based ladder compounds AFe2X3 (A = K, Rb, Cs, Ba; X = S, Se, Te) [2,3]. Crystal structure is novel, comprising of FeX4 tetrahedra with channels which host A atoms, and four-fold coordinated Fe2+ ions form two-leg ladder geometry. Unlike most of parent compounds of the Fe-based SCs, the ladder compounds are insulating down to the lowest measured temperature. Through bulk properties and neutron diffraction measurements, a variety of magnetic structures and low dimensional characteristics were elucidated. These would provide a clue of the SC realized in a separate dimension systems. The description of theory that accounts for the observed magnetic structures will be also presented.

[1] *G.R. Stewart, Rev. Mod. Phys. 83, 1589 (2011).,* ***[2]*** *Y. Nambu et al., Phys. Rev. B 85, 064413 (2012).,* ***[3]*** *F. Du et al., Phys. Rev. B 85, 214436 (2012).*

Keywords: Fe-based ladder, superconductivity, magnetic structure