表題：正方格子磁性体における新規磁気相の探索

Novel magnetic state in a series of new square-lattice magnets

Tendai Haku and Takatsugu Masuda
ISSP, the University of Tokyo

Layered metal oxyfluorides/oxychlorides A2MO3X (A = Ca, Sr, M = Mn, Fe, Co, Ni, Cu, X=F, Cl) are members of a new family of 2D square lattice antiferromagnets [1,2]. In this study, we have paid attention to Sr2NiO3Cl and Sr2MnO3F. Neutron diffraction measurements on both samples were performed at a powder diffractometor Echidna in ANSTO. Although the ground state of Sr2MnO3F at 3 K is a conventional antiferromagnetic phase having q = (1/2, 1/2, 0), the magnitude of a magnetic moment was 3.04 μ B, which is suppressed from that of a free Mn3+ ion 4.0 μ B. The result suggests that magnetic fluctuation plays important role and disturb a magnetic order. We cannot understand the suppression with a simple 2D dimensionality. Hence we can expect that there are other type quantum fluctuations somewhere. On the other hand, we have not obtained experimental evidence for magnetic ordering on Sr2NiO3Cl by using a neutron diffraction technique.

We performed the powder inelastic neutron scattering on Sr2MnO3F and Sr2NiO3Cl at MERLIN in ISIS to reveal the magnetic excitation. On Sr2MnO3F, the measurements performed on a couple of temperature which is under and over the N el temperature. The Gd chopper was used and the speed was 400Hz. Ei were 50.1 meV, 26.2 meV and 16.0 meV. The measurement for Sr2NiO3Cl was performed under the N el temperature. We use the Gd chopper and the speed was 250Hz. Ei were 109 meV, 30 meV and 13.8 meV. The dispersion curve of which local minimum has at q = (1/2, 1/2, 0) and energy gap is 8 meV was observed. Since it is a typical behavior of a classical spin wave excitation of antiferromagnets with magnetic anisotropy, we are analyzing the data by the two-dimensional square lattice model with XXZ-type anisotropy. We cannot obtain any excitations on Sr2NiO3Cl. Combined with the diffraction data, Sr2NiO3Cl has no magnetic order or a magnetic order with a small ordered magnetic moment which cannot measure by using neutron scattering techniques. In any case, a magnetic order was disturbed by quantum fluctuations raised by both of low dimensionality and magnetic frustration.

[1] C. S. Knee et al., Phys. Rev. B 68, 174407 (2003).
[2] Y. Tsujimoto et al., Inorg. Chem. 51, 4802 (2012).

使用施設：JRR-3M，装置：C1-1:HER
分野：Magnetism