The magnetic structure of K4Cu4OCl10 as new ideal isotropic quantum spin tetrahedral system.

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K4Cu4OCl10 is a new isotropic spin tetrahedral system, with almost isotropic magnetic coupling within the tetrahedron and three-dimensional connection of the tetrahedral. The system shows unconventional magnetic phase transition, enters a spin-singlet states at T = 11 K, and then enters antiferromagetic states at TN = 4.4 K, as shown in Fig. 2. The μ SR experiment suggested an incommensurate magnetic order in K4Cu4OCl10 [M. Fujihala et al., Phys. Rev. B 87 (2013) 144425.]. However, the magnetic structure of K4Cu4OCl10 has not been determined. In Cu2Te2O5X2 (X = Cl, Br), the magnetic order is propagated with the incommensurate wave vector k = (α , β , 1/2) that is related to one-dimensional chain feature of the tetrahedral [O. Zaharko et al., Phys. Rev. Lett. 93 (2004) 217206.]. For the understanding of the isotropic spin tetrahedral system, the determination of detailed magnetic structure of three-dimensional coupled-spin tetrahedral system K4Cu4OCl10 is important.

For determination of the magnetic structure, we investigated a sample in different scattering zone (H K 0), (H 0 L) of K4Cu4OCl10 at the E-4, HZB.

Magnetic intensity appear at (1 1 1) below TN, and Figure 1 shows temperature dependence of that. This result is evidence of a commensurate magnetic order in K4Cu4OCl10.

The experiment was performed by using E4 at HZB, Germany, which was transferred from T2-2:FONDER at JRR-3 with the approval of Institute for Solid State Physics, The University of Tokyo (proposal no. NSL-00000375), Japan Atomic Energy Agency, Tokai, Japan.

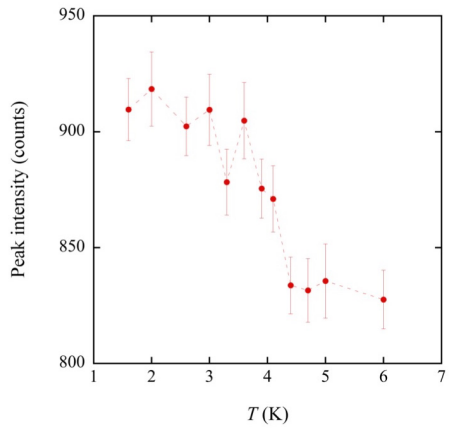

Fig. 1. Fig.1 Variation of the peak intensity of the 111 peak.