Magnetic Fluctuations in a Ternary Alloy CuFePt6

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CuFePt6 has fcc fundamental structure and forms Cu3Au-type ordered structure below 1313 K[1]. In the ordered structure, Cu and Fe occupy corner sites with equal occupation probabilities while Pt occupies face centered sites. In spite of the simple atomic arrangement in the ordered structure, its magnetic behavior is complicated. In the process of zero-filed cooling (ZFC) it undergoes successive transitions of ferromagnetic at Tc1=200K and ferrimangetic at Tc2=100K. In the process of field cooling, on the other hand, only a ferromagnetic phase appears below Tc. The behaviors indicate existence of competitive interactions of ferromagnetic and antiferromagnetic which are sensitively dependent on the magnetic field. To investigate field dependence of the magnetic structure, elastic and inelastic neutron scattering measurements were performed at the triple-axis-spectrometer PONTA. In the measurements, intensity of magnetic scattering at around Gamma and M points of the ordered structure have been investigated under FC and ZFC processes. Magnetic field was applied up to 70 Oe with using Helmholtz coil. In order to compare the behavior of elastic and inelastic components of magnetic scattering, elastic intensities have been measured under triple axis mode.

Figure 1(a) shows X point magnetic Bragg scattering for FC and ZFC process. Intensities of the ferrimagnetic component does not change under FC and ZFC processes, though ferrimagnetic phase does not appear in the magnetization measurement. It has been confirmed in the measurements at FONDER that ferrimagnetic component remains under the magnetic field of up to 1.5kOe. Ferromagnetic Bragg scattering at Gamma point also shows no dependence of magnetic field. Figure 1(b) shows inelastic intensities of dE=2 meV along 0kk with and without magnetic field below Tc2. Without magnetic field, inelastic peaks have been observed at k=0.45 and 0.65. When applying field of only 70 Oe, peaks disappear and intensities of higher back ground were observed. The results show that there exists dynamical fluctuation in the magnetic structure which is easily suppressed by weak magnetic field. Further experiments should be necessary to clarify the origin of the magnetic fluctuation.

[1]M. Takahashi, E. Ahmed, A. K. Das, Y. Fujii, H. Iwasaki, and K. Ohshima; Journal of Alloys and Compounds 453, 75-78 (2008).

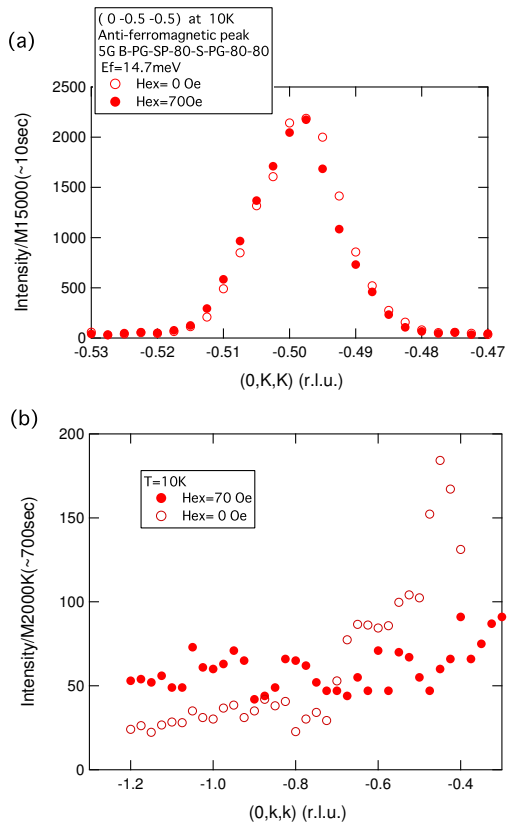

Fig. 1. (a)Magnetic Bragg scattering at X point under FC and ZFC processes. (b)Inelastic intensities around X point with and without magnetic field below Tc2.