μSR study on $CuCr_{1-x}Mg_xO_2$

Y. Ikedo[1], J. Sugiyama[1], H. Nozaki[1], K. Mukai[1], P. L. Russo[2], D. Andreica[3], A. Amato[4], Y. Ono[5], and T. Kajitani[5]

[1]*Toyota Central R&D Labs. Inc., Nagakute, Aich 480-1192, Japan*
[2]*TRIUMF, Vancouver, BC V6T 2A3, Canada*
[3]*Faculty of Physics, Babes-Bolyai University, RO-3400 Cluj-Napoca, Romania*
[4]*Laboratory for Muon-Spin Spectroscopy, Paul Scherrer Institut, Villigen 5232 PSI, Switzerland*
[5]*Department of Applied Physics, Graduate School of Engineering, Tohoku University, Sendai, Miyagi 980-8579, Japan*

According to past neutron diffraction measurements [1], delafossite-type oxide $CuCrO_2$ undergoes an antiferromagnetic (AF) transition with T_N = 26 K, and exhibits long-range static AF order with a 120^O spin structure within the plane including the c-axis. In order to clarify the magnetism of $CuCrO_2$, we have performed μ^+SR experiments on $CuCr_{1-x}Mg_xO_2$ (x=0-0.03) using the πE (Dolly spectrometer) beam line at PSI.

Figure 1 shows the T dependences of (a) the weak transverse field (wTF) A_{TF} for the x=0 and the x=0.03 samples, and (b) μ^+-spin precession frequency obtained from the zero field (ZF) μ^+SR spectrum for $CuCrO_2$. The $A_{TF}(T)$ curves for both samples exhibit a abrupt decrease at T_N =26 K with decreasing T, i.e. the Mg^{2+} substitution for Cr does not alter the magnitude of T_N. The ZF μ^+SR measurements however indicate that spontaneous muon-spin precession ($\sim$50 MHz at $T \to 0$ K) is clearly observed for the x=0 sample below T_N, whereas the absence of static order for the x=0.03 sample even at the lowest T (1.8 K) measured.

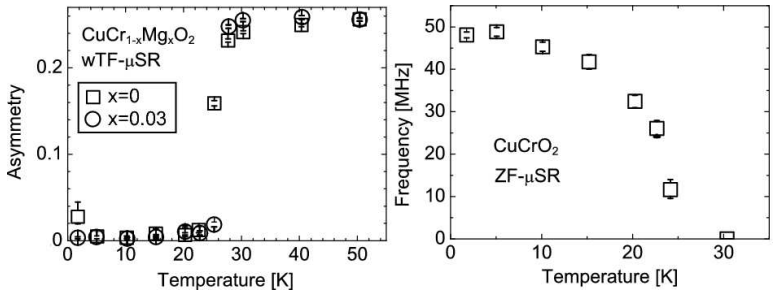

Fig. 1: T dependences of (a) A_{TF} for $x = 0$ and $x = 0.03$, (b) μ^+ spin precession frequencies of ZF μ^+SR spectra for $x = 0$.

[1] H. Kadowaki et al., J. Phys. Condens Matter, 2 (1990) 4480.