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DU-03. The magnetic hyperfine interaction in $FeCr_{2-x}Al_xS_4$(x=0.3, 0.5). *C. Kim*[1], S. Kim[1] and C. Kim[1] *1. Physics, Kookmin University, Seoul, South Korea*

The polycrystalline samples of Al-doped $FeCr_{2-x}Al_xS_4$ (x=0.3, 0.5) have been studied with X-ray diffraction, magnetization, and Mössbauer spectroscopy measurements. The crystal structure is found to be cubic spinel with space group of Fd-3m from the Rietveld refinement of x-ray diffraction. The lattice constants of $FeCr_{2-x}Al_xS_4$ (x=0.3, 0.5) are found to be a_0=9.994 Å, and 10.010 Å, respectively. The magnetic susceptibility follows a Curie-weiss law with a positive θ= 141 K and 129 K showing ferrimagnetic behaviors. The saturated magnetic moment of $FeCr_{2-x}Al_xS_4$ (x=0.3, 0.5) are found to be 1.14, and 0.64 μB, respectively. The coeicivity of $FeCr_{2-x}Al_xS_4$ (x=0.3, 0.5) at 77 K are 111 and 200 Oe, respectively, which indicates that non-magnetic Al ions act as a pining center in the samples. Also, the value of coercivity increases with increase in Al concentration. Mössbauer spectra of $FeCr_{2-x}Al_xS_4$ (x=0.3, 0.5) have been taken at various temperatures ranging from 4.2 to 300 K, to understand the localized nearest neighbor effects on effective field. Mössbauer spectra change from asymmetrical 8-lines to 6 line shapes with increasing temperature, which suggests the decrease in the electric quadrupole interactions relative to magnetic dipole interaction. Néel temperature (T_N) of $FeCr_{2-x}Al_xS_4$ (x=0.3, 0.5) are determined to be 143 and 130 K, respectively, and the symmetrical 2 line shapes are shown above T_N. We have observed that the magnetic hyperfine field (H_{hf}) decreases with increasing Al concentration. We also notice the severely distorted Mössbauer line shape at 4.2 K, which is consistent with the enhancement of crystalline anisotropy with increase in Al concentration. Isomer shift values of the samples at room temperatures for $FeCr_{2-x}Al_xS_4$ (x=0.3, 0.5) are found to be 0.48 mm/s, and 0.51 mm/s, relative to the Fe metal, which are consistent with the Fe^{2+} valence state.