59TH ANNUAL CONFERENCE ON

MAGNETISM AND MAGNETIC MATERIALS

3-7 NOVEMBER 2014 • HONOLULU, HAWAII

ABSTRACTS

AIP Publishing

IEEE MAGNETICS 56 YEARS

Jointly sponsored by AIP Publishing, LLC and the IEEE Magnetics Society

CT-05. Hyperfine structure and magnetdic properties of Zn doped Co_2Z hexaferrite based on high-field Mössbauer spectroscopy. *J. Lim*[1], E. Hahn[2] and C. Kim[1] *1. Department of Physics, Kookmin University, Seoul, Republic of Korea; 2. Department of Physics, University of Suwon, Suwon, Republic of Korea*

The polycrystalline samples of $Ba_3Co_{2-x}Zn_xFe_{24}O_{41}$ (x = 0.0, 0.5, 1.0, 1.5, 2.0) were synthesized by the standard solid-state-reaction method. The crystallographic and magnetic properties of samples were investigated by using x-ray diffractometer (XRD), vibrating sample magnetometer (VSM), and Mössbauer spectroscopy. From the XRD patterns analyzed by Rietveld refinement, we determined to be a single-phased with hexagonal structure ($P6_3/mmc$). With increasing Zn ion contents, the unit cell volume (V_u) of samples increased, because Fe^{3+} ions are transferred from tetrahedral sites to octahedral sites. Based on the applied-field dependent hysteresis curves at 295 K, the saturation magnetization (M_s) of samples increased and coercivity (H_c) decreased with increasing Zn ion contents. The M_s increases due to preferential occupation of non-magnetic Zn ions in the tetrahedral sublattices with down-spin site. Also, the decrease in H_c is because Co ion concentration of high magnetic anisotropy decrease. From the temperature dependence of the zero-field-cooled (ZFC) magnetization curves under 100 Oe between 4.2 and 750 K, the Curie temperature (T_C) were found to be decreasing with increasing Zn contents. We have obtained zero-field Mössbauer spectra of all samples at various temperatures ranging from 4.2 to 750 K, and analyzed the spectra below T_C as six distinguishable sextets due to superposition of ten-sextets for Fe sites corresponding to the Z-type hexagonal ferrite. Also, the hyperfine field (H_{hf}) and electric quadrupole shift (E_Q) have shown abrupt changes around spin transition (T_S). In addition, Mössbauer spectra of all samples at 4.2 K were taken with applied field ranging from 0 to 50 kOe. As a result, the canting angle between applied field and H_{hf} of samples decreased with increasing Zn concentration.

[1] S. H. Chun, Y. S. Chai, B.-G. Jeon, H. J. Kim, Y. S. Oh, I. Kim, H. Kim, B. J. Jeon, S. Y. Haam, J.-Y. Park, S. H. Lee, J.-H. Chung, J.-H. Park, and K. H. Kim, Phys. Rev. Lett **108**, 177201 (2012).