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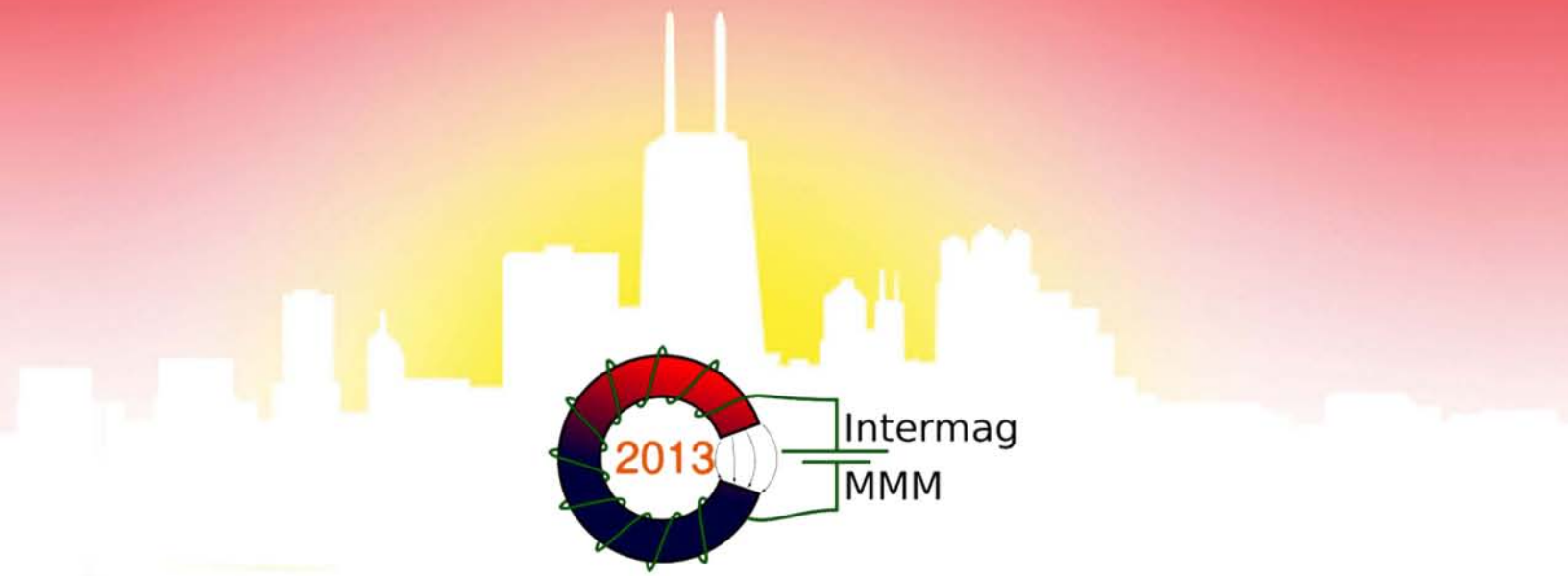
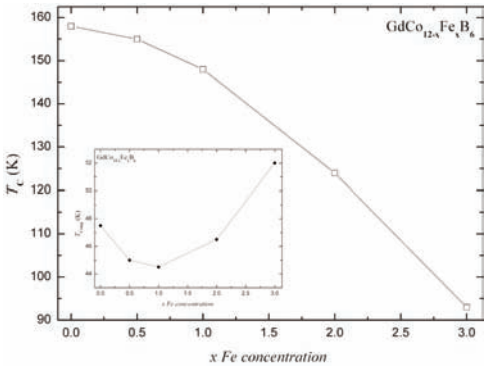


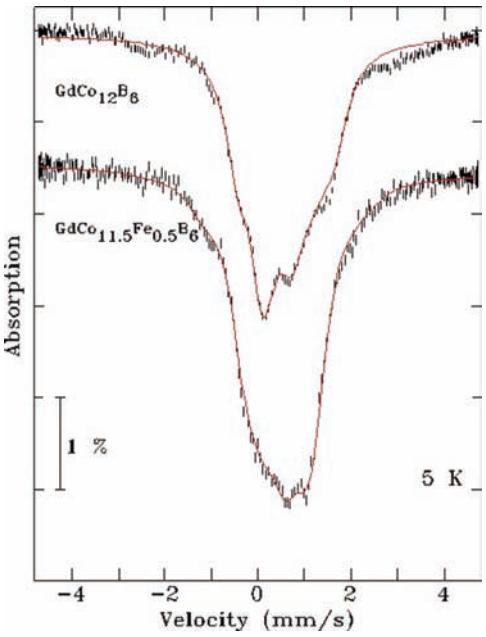
ABSTRACTS

IEEE MAGNETICS

AIP American Institute of Physics



The T_c and T_{comp} (inset) are smooth functions of doping.



^{155}Gd Mössbauer spectra of $GdCo_{12-x}Fe_xB_6$.

GU-09. Investigation of spin ordering in antiferromagnetic $Fe_{1-x}Mn_x$-PO_4 with Mössbauer spectroscopy. *W. Kwon*[1], B. Lee[2] and C. Kim[1] *1. Department of Physics, Kookmin University, Seoul, Republic of Korea; 2. Department of Physics, Hankuk University of Foreign studies, Yongin, Kyungki, Republic of Korea*

We have investigated the spin ordering in $Fe_{1-x}Mn_xPO_4$ samples, as a possible cathode material for rechargeable lithium ion battery, with antiferromagnetic structure below Né el temperature (T_N) [1-2]. The prepared $Fe_{1-x}Mn_xPO_4$ (x = 0.0, 0.1, and 0.3) samples have orthorhombic structures with space group of *Pnma* [3]. These samples show the magnetic phase transition, caused by the strong crystalline field at the MO_6 octahedral sites. The lattice constants of the $Fe_{1-x}Mn_xPO_4$ samples were determined to be a_0 = 9.814 Å, b_0 = 5.787 Å, and c_0 = 4.783 Å for x = 0.0, a_0 = 9.833 Å, b_0 = 5.811 Å, and c_0 = 4.786 Å for x = 0.1, and a_0 = 9.979 Å, b_0 = 5.895 Å, and c_0 = 4.799 Å for x = 0.3. According to the temperature dependent magnetic susceptibility of $Fe_{1-x}Mn_xPO_4$, all samples showed abnormal antiferromagnetic behaviors. The Né el temperature (T_N) decreased from 114 K at x = 0.0 to 97 K at x = 0.3 with Mn concentrations. The magnetization of $Fe_{1-x}Mn_xPO_4$ decreases until the temperature reaches the spin-reorientation (T_S) temperature, and then starts increasing as the temperature increases up to T_N. The T_S of the $Fe_{1-x}Mn_xPO_4$ were found to be 30, 27, and 24 K for x = 0.0, 0.1, and 0.3. In order to investigate the hyperfine interaction of Fe^{3+} ions in FeO_6 octahedral sites, Mö ssbauer spectra of $Fe_{1-x}Mn_xPO_4$ have been taken at various temperatures from 4.2 to 295 K. The isomer shift (δ) values of the $Fe_{1-x}Mn_xPO_4$ were between 0.31 and 0.43 mm/s, indicating the high spin state of Fe^{3+} at all temperatures. The magnetic hyperfine field (H_{hf}) and electric quadrupole splitting (ΔE_Q) values of $Fe_{0.9}Mn_{0.1}PO_4$ at 4.2 K were determined to be H_{hf} = 497 kOe and ΔE_Q = 2.15 mm/s. We have also observed the abrupt changes in H_{hf} and ΔE_Q at 27 K, and decrease in T_S of $Fe_{1-x}Mn_xPO_4$ with Mn concentration. Our study suggests that these changes in $Fe_{1-x}Mn_xPO_4$ are originated from the strong electric crystalline field and spin-obit coupling of FeO_6 octahedral site.

[1] S. Chung, J. Kim, Y. Kim, and Y. Lee, Adv. Mater. **23**, 1398 (2011). [2] S. P. Ong, V. L. Chevrier, and G. Ceder, Phys. Rev. B **83**, 075112 (2011). [3] W. Kim, C. H. Rhee, H. J. Kim, S. J. Moon, and C. S. Kim, Appl. Phys. Lett. **96**, 242505 (2010).

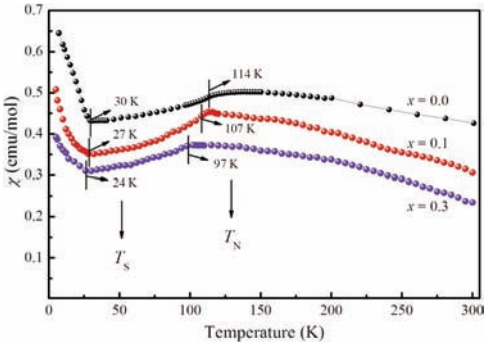


Fig. 1. The temperature dependence of magnetic susceptibility for $Fe_{1-x}Mn_xPO_4$ (x = 0.0, 0.1, and 0.3).

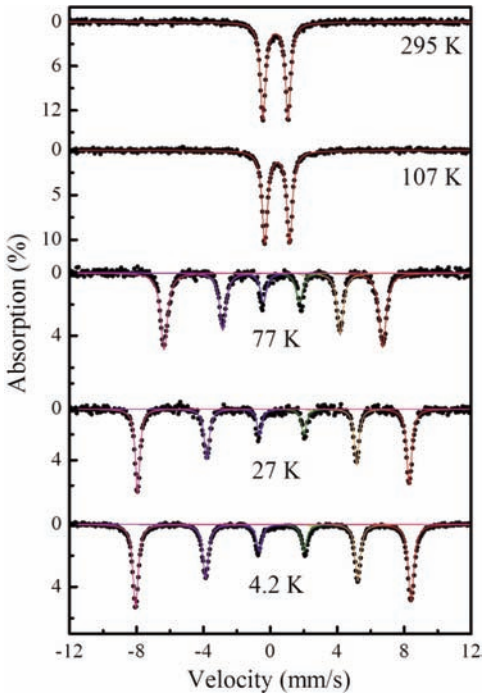


Fig. 2. Mössbauer spectra of $Fe_{0.9}Mn_{0.1}PO_4$ at various temperatures.

GU-10. Magnetic States of UCuGe1-xSnx Compounds Found by 119Sn Mössbauer Spectroscopy. *V. Krylov*[1] *1. Institute of Nuclear Physics, Moscow State University, Moscow, Russian Federation*

The non-collinear antiferromagnetic (AFM) compounds UCuGe and UCuSn with competing exchange interactions crystallize in ordered derivatives of hexagonal CaIn2 structure: hexagonal SrPtSb-type and orthorhombic P21cn structure, respectively. In these compounds, uranium magnetic moments are equal to about 2.0 μB and are ordered below TN =62(2) K [1, 2]. The hyperfine interactions on 119Sn nuclei of UCuGe1-xSnx compounds (X = 0.0 –