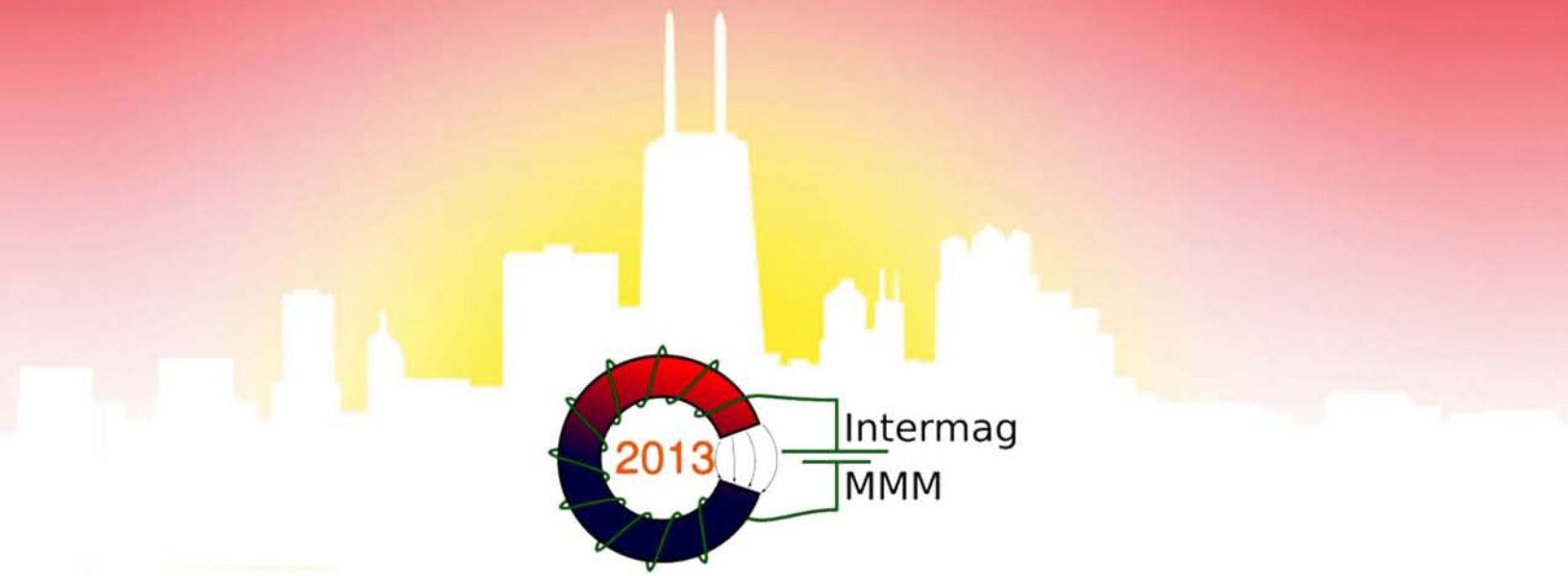
12TH JOINT MMM–INTERMAG CONFERENCE

January 14–18, 2013

Chicago, Illinois, USA



ABSTRACTS

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mation, in uniform Eu-Fe matrix, of 100-500nm size regions; the XAS spectra reveal that in the Eu-Fe film, two different chemical states (for both europium and iron) are present. The magnetic properties of the Eu-Fe films, based on SQUID measurements, are associated with the iron atoms or with aggregates of iron atoms. Ferromagnetic ordering is observed for all films, even at room temperature. The M-T curves measured in FC and ZFC modes indicate that Eu-Fe films show a blocking phenomenon and include superparamagnetic components. The M-T curves measured in FC mode indicate that several Eu-Fe films show behavior typical of spin glass or super spin glass. Moreover, exchange bias phenomenon, usually related to the interface between the ferromagnetically and antiferromagnetically coupled layers, has been observed for Eu-Fe films. For selected films, some anomalies were also observed in temperature dependent measurements of electrical resistivity. This work was supported by the NSF grant DMR0907053 and by the SPINLAB project financed by the EU European Regional Development Fund.

AS-14. Critical phenomena in double-exchange ferromagnets $Pr_{1-x}Pb_xMnO_3$. *D. Ginting*[1], D. Nanto[1], Y.D. Zhang[1], S.C. Yu[1] and T.L. Phan[1] *1. Physic, Bk 21 Chungbuk National University, Cheongju, Republic of Korea*

Colossal mangnetoresistance (CMR) and many other interesting magnetic properties discoveried in hole-doped perovskite manganites of $R_{1-x}A'_xMnO3$ (R = La, Pr; A'= Pb, Ca, Sr etc.) around their ferromagnetic-paramagnetic phase transition temperature (T_C, the Currie temperature) have attracted much interest [1]. Among these, $Pr_{1-x}Pb_xMnO_3$ compounds have received special interest because of showing both CMR and giant magnetocaloric effect [2]. To further understand this material system and the Pb-doping influences on the magnetic and magnetotransport properties, we have prepared $Pr_{1-x}Pb_xMnO_3$ (x = 0.1 and 0.2) by the solid-state reaction technique at 1000 ^oC in air for 24 h. The single phase of final products in a pseudo-cubic structure was confirmed by an X-ray diffractometer. Magnetic measurements were performed on a vibrating sample magnetometer with the magnetic-field range of 0-12 kOe. The experimental results reveal that all the samples undergo a second-order magnetic phase transition. Using the modified Arrott plot method, the critical parameters obtained are T_C≈150.1 K, β = 0.443, γ = 1.337 and δ = 3.8 for x = 0.01, and T_C≈ 203.8 K, β = 0.468, γ = 1.353, and δ = 3.1 for x = 0.02. With these critical exponents, the isothermal magnetization data of the samples around T_C fall into two branches of a universal function $M(H, \varepsilon) = |\varepsilon|^{\beta} f_{\pm}(H/|\varepsilon|^{(\beta+\gamma)})$, where $\varepsilon = (T-T_C)/T_C$ is the reduced temperature. This proves that the critical parameters determined are reliable, and in good accordance with the scaling hypothesis. Here, the values of β obtained for x = 0.01 and 0.02 are located in between those expected for the mean-field theory (β = 0.5) and the Heisenberg model (β = 0.365). This proves an existence of ferromagnetic short-range order in $Pr_{1-x}Pb_xMnO_3$. Notably, high Pb-doping contents lead to ferromagnetic long-range order. The nature of this phenomenon is being explained in detail. Fig. 1. $M_s(T)$ and $\chi_0^{-1}(T)$ data fitted to critical functions for $Pr_{1-x}Pb_xMnO_3$ with (a) x = 0.1 and (b) 0.2.

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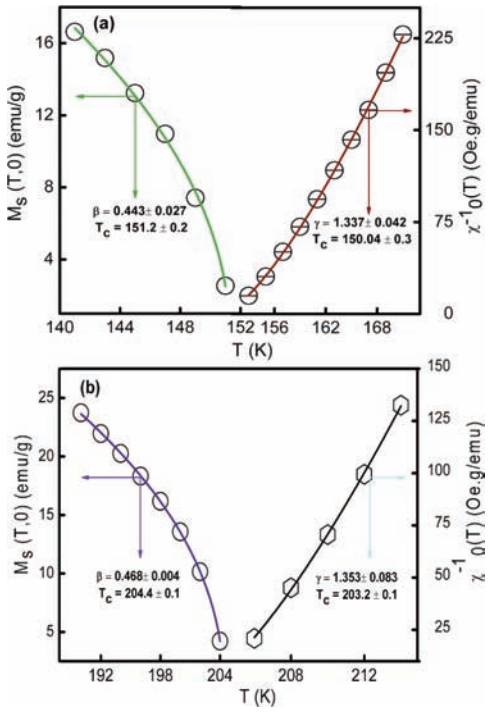

AS-15. Magnetic properties of proton irradiated $BiFeO_3$. *S. Han*[1], S. Kim[1] and C. Kim[1] *1. Department of Physics, Kookmin University, Seoul, Republic of Korea*

The weak ferromagnetic behavior of $BiFeO_3$ has been studied extensively by doping, oxygen deficiency, and low temperature system [1-3]. Here, we report the weak ferromagnetic behavior in $BiFeO_3$ induced by proton irradiation of 0, 10 and 20 pC/μm^2. The magnetic properties of proton irradiated $BiFeO_3$ were investigated with x-ray diffraction (XRD), vibrating sample magnetometer (VSM), and Mö ssbauer spectroscopy measurements. From the Rietveld refinement analysis of the XRD patterns, the crystal structure of $BiFeO_3$ is determined to be rhombohedral with the space group of *R3c* at 295 K. However, we noticed that the (012) peak intensity decreased after proton irradiation as shown in Fig. 1, indicating the disappearance of atoms on (012) plane due to proton irradiation. This results in the decrease of lattice constant a_0 from 5.5814 to 5.5800 Å. The Mö ssbauer spectra were measured at 295 K, and analyzed with 2-set sextet. And the isomer shift (δ) for the iron ion is determined to be Fe^{3+} valence state in octahedral sites. We observed a doublet line in Mö ssbauer spectra of proton irradiated $BiFeO_3$, which also indicates the missing atoms. The magnetization hysteresis (M-H) curves measured under applied field of 15 kOe at 295 K display the weak ferromagnetic behavior as shown in Fig. 2. The values of the coercivity (H_C) increased from 15 to 252 Oe with increasing proton irradiation. Our study suggests that the total magnetic moment is proton irradiated $BiFeO_3$ is not zero due to the disappearance of atoms after proton irradiation. From the remanent moment, proton irradiated $BiFeO_3$ revealed the weak ferromagnetic behavior.

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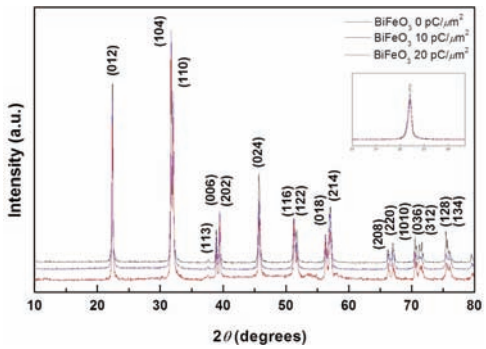

Fig. 1. XRD patterns of 0, 10, and 20 pC/μm^2 proton irradiated $BiFeO_3$.

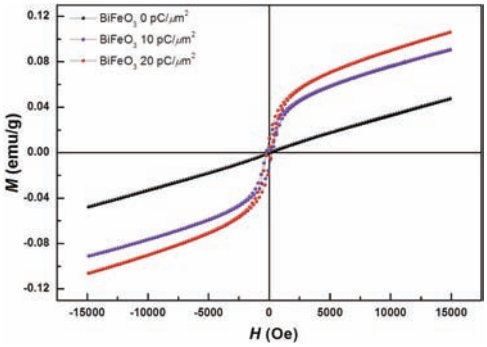

Fig. 2. The M-H curves of 0, 10, and 20 pC/μm^2 proton irradiated $BiFeO_3$ at 295 K.

AS-16. Spin-phonon coupling probed by infrared transmission spectroscopy in the double perovskite Ba2YMoO6. *Z. Qu*[1], Y. Zou[1], S. Zhang[1], L. Ling[1], L. Zhang[1] and Y. Zhang[1,2] *1. High Magnetic Field Laboratory, Chinese Academy of Sciences, Hefei, Anhui, China; 2. High Magnetic Field Laboratory, University of Science and Technology of China, Hefei, Anhui, China*

The double perovskite Ba2YMoO6 has recently attracted considerate interest due to its unconventional magnetism. [1-3] Spins are found to gradually freeze into a disordered pattern of spin singlet dimers with the decreasing temperature, forming an exotic valence bond glass state. [1-3] An open question is whether the formation of the spin singlet dimers is accompanied with structural distortion. In this work, we investigate the local structural distortion by means of infrared transmission spectroscopy. At 300 K, three bands are observed at ~ 255.1 cm^-1, ~ 343.4 cm^-1, and ~ 561.5 cm^-1, which should be related to the motion between the cation Ba^2+ and the anion YMO6^-2, the Y-O stretching motion and the stretching vibration of the MoO6 octahedron, respectively. These modes continue to harden upon cooling owing to the shrink of the lattice constant. When the temperature decreases to T ≤ 130 K around which the spin singlet dimer begins to form [1,3], an additional phonon mode appears at ~ 611 cm-1, suggesting the occurrence of local distortion of MoO6 octahedron. With further decrease of the temperature, its intensity enhances and its peak position keeps unchanged. These results indicate that the formation of the spin singlet dimers is accompanied with the occurrence of the local structure distortion of MoO6 octahedron, providing evidence for the strong spin-phonon coupling in the double perovskite Ba2YMoO6.

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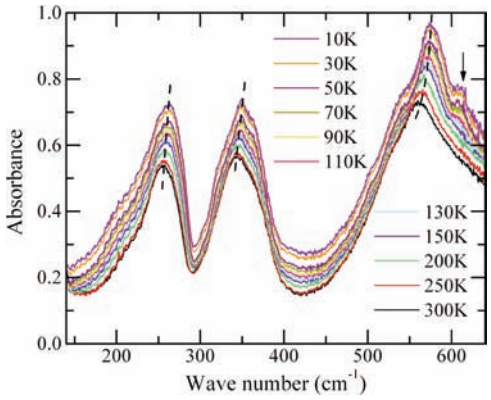

The infrared transmission spectra measured at various temperatures for Ba2YMoO6.