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ABSTRACTS

Session DT
CRITICAL PHENOMENA AND SPIN GLASSES (POSTER SESSION)

Jeffrey Lynn, Chair

CONTRIBUTED PAPERS

DT-01. Spin-reorientation in the antiferromagnetic ordering of $LiFe_{1-x}Mn_xPO_4$ investigated with Mössbauer spectroscopy.
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The olivine-structured $LiMPO_4$ (M= Fe, Ni, Co and Mn) materials show the magnetic phase transition by the strong-crystalline field on the MO_6 octahedral sites. In this study, we have investigated the abnormal spin ordering in $LiFe_{1-x}Mn_xPO_4$ materials with antiferromagnetic structure below Néel temperature (T_N). The lattice constants of the prepared $LiFe_{1-x}Mn_xPO_4$ samples were determined to be a_0 = 10.3412 Å, b_0 = 6.0150 Å and c_0 = 4.6953 Å for x=0.1, a_0 = 10.3652 Å, b_0 = 6.0333 Å and c_0 = 4.7067 Å for x=0.3 and a_0 = 10.3900 Å, b_0 = 6.0521 Å and c_0 = 4.7174 Å for x=0.5. The temperature dependence of the zero-field-cooled (ZFC) magnetization curves showed abnormal antiferromagnetic behavior as well as decrease in T_N with Mn substitution from 48 K ($LiFe_{0.9}Mn_{0.1}PO_4$) to 45 K ($LiFe_{0.5}Mn_{0.5}PO_4$). It is noticeable that the magnetization decreases until the temperature reaches the spin-reorientation temperature, and then increases up to T_N. The spin-reorientation temperatures (T_s) of the $LiFe_{1-x}Mn_xPO_4$ (x= 0.1, 0.3, 0.5) were found to be 10, 9 and 8 K from the temperature-dependent ZFC magnetization curves. In order to investigate the hyperfine interaction of Fe^{2+} ions in FeO_6 octahedral sites, Mössbauer spectra of the $LiFe_{1-x}Mn_xPO_4$ were obtained at various temperatures from 4.2 K to room temperatures. The magnetic hyperfine field (H_{hf}) and electric quadrupole splitting (ΔE_Q) values of $LiFe_{0.5}Mn_{0.5}PO_4$ at 4.2 K were determined to be H_{hf}= 124 kOe and ΔE_Q= 3.07 mm/s. Also, we have observed abruptly changes in H_{hf} and ΔE_Q at 8 K with increasing temperature, which is caused by the strong electric crystalline field of octahedral symmetry. The decrease of T_s in $LiFe_{1-x}Mn_xPO_4$ can be explained by the different crystal field and spin-orbit coupling in Fe^{2+} site depending on the Mn concentrations.

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DT-02. The spin reorientation transition and melting of stripe domains.
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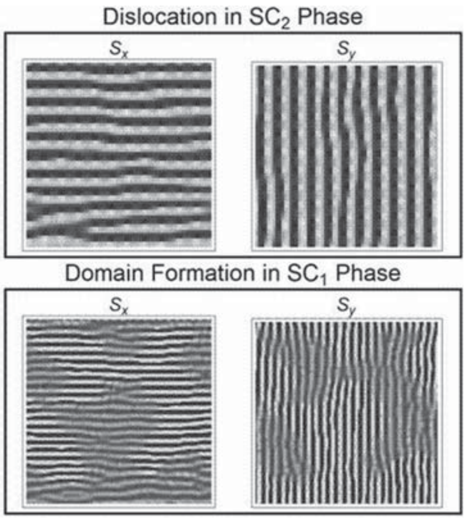
In some thin magnetic films, of typically a few atomic layers, strong perpendicular anisotropy can lead to Ising like ground states. These systems seve as experimental models for two dimensional Ising systems and display a phase diagram with a number of distinct phases [1,2,3,4]. These systems exhibit a rich variety of phases transitions including spin reorientation and tetratic phase transitions (see the Figure for examples of excitations preceding a transition). Focused ion beam bombardent can be used to modify the properties of these films or create pinning sites. We examine, through numerical simulation, the stabililty of domain patterns existing in films, near the reorientation transition, patterned with ion beams into cubic arrays of pinning centres with periodicity comparable to the natural periodicity of striped domains that form in the non-irradiated films. We show how out-of-plane oriented domains evolve into in-plane orientations with particular emphasis on fluctuations and memory of the pinned stripe array system.

1. M. Carubelli, O. V. Billoni, S. A. Pigh n, S. A. Cannas, D. A. Stariolo, and F. A. Tamarit, Phys. Rev. B, 77(13):134417, Apr 2008. 2. S. A. Cannas, M. F. Michelon, D. A. Stariolo, and F. A. Tamarit, Phys. Rev. B, 73(18):184425, May 2006. 3. S. A. Cannas, D. A. Stariolo, and F. A. Tamarit, Phys. Rev. B, 69(9):092409, Mar 2004. 4.J. P. Whitehead, A. B. MacIsaac, and K. De'Bell, Phys. Rev. B, 77(17):174415, May 2008.



Defects formed near stripe melting transition.

DT-03. The scaling hysteresis behavior of double perovskite $Ba_{1.8}La_{0.2}FeMoO_6$ pellet around the Curie temperature.
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Recently, huge interest has been attracted for materials with double perovskite structure of A_2BBO_6 due to the many technological demands with better magnetic properties such as a larger magnetic moment and ferromagnetism above the room temperature. For instance, double perovskite Ba_2FeMoO_6 (BFMO) shows room temperature ferromagnetism with Curie temperature T_c about 320 ~ 340 K. The magnetic properties of BFMO are originated from the ordered arrangement of Fe and Mo ions. However, very few studies on a hysterectic behavior of the double perovskite BFMO are reported. In this work, we systematically investigate the hysteresis behavior