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$_x$PO$_4$ materials with antiferromagnetic structure below Néel temperature ($T_N$). The lattice constants of the prepared LiFe$_{1-x}$Mn$_x$PO$_4$ 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 magnetic phase transition, patterned with ion beams into cubic arrays of pinning centres.

In some thin magnetic films, of typically a few atomic layers, strong perpendicular anisotropy can lead to Ising like ground states. These systems serve 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 tetragonal phase transitions (see the Figure for examples of excitations preceding a transition). Focused ion beam bombardment can be used to modify the properties of these films or create pinning sites. We examine, through numerical simulations and memory of the pinned stripe array system.

Recently, huge interest has been attracted for materials with double perovskite structure of A$_2$BBO$_6$ 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$_{1.8}$La$_{0.2}$FeMoO$_6$ (BFMO) shows room temperature ferromagnetism with Curie temperature $T_c$ about 320 ~ 340 K. The magnetic properties of BFMO are better than those of single perovskites Ba$_2$FeMoO$_6$ (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 hysteretic behavior of the double perovskite BFMO are reported. In this work, we systematically investigate the hysteresis behavior of BFMO 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.