MAGNETIC ANISOTROPY IN $La_{0.67}Sr_{0.33}MnO_3$ THIN FILMS, NANOWIRES, AND NANODOTS

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We have investigated the magnetic anisotropy of $La_{0.67}Sr_{0.33}MnO_3$ (LSMO) thin films, nanowires/nanodots. LSMO thin films of different thickness are grown epitaxially by pulsed laser deposition on vicinal TiO_2-terminated $SrTiO_3$ (STO) substrates having regular arrays of unit cell high surface steps. Due to the epitaxial growth, the step-terrace structure of the substrate is replicated up to the film surface as observed by atomic force microscopy. Magnetic anisotropy studies by vibrating sample magnetometry (VSM) and torque measurements done on these LSMO films reveal predominantly uniaxial anisotropy at room temperature and biaxial anisotropy at low temperature. The uniaxial anisotropy is induced by steps at the film surface with the easy axis lying along the step direction. At low temperatures, biaxial magnetocrystalline anisotropy dominates with [110] as easy and [100] direction as hard axes and with no significant dependence on the step orientation. LSMO nanowires and nanodots were prepared using laser interference lithography with periodicity of 400-600nm and size of 100-250nm and their magnetic properties were characterized. In this presentation, we will compare the results obtained for continuous LSMO films with those obtained for wires and dots.