INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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In the present thesis, the structural, electrical and magnetic properties of $Nd_{0.7}Sr_{0.3}MnO_3$ (NSMO) and $Nd_{0.8}Na_{0.2}MnO_3$ (NNMO) films as well as bilayers of NSMO/NNMO and $La_{0.7}Sr_{0.3}MnO_3/LaFeO_3$ (LSMO/LFO) are presented.

Single phase cylindrical targets of NSMO and NNMO by solid state route and, LSMO and LFO by sol-gel route were prepared. Several NSMO films were grown by choosing different substrates and by varying the parameters such as post-annealing temperature and film thickness. NSMO films of 120 nm thickness grown on 001-Al_2O_3 are found to be in polycrystalline form. They all exhibit ferromagnetic transition and the T_C value is found to increase with post-annealing temperature. Similar polycrystalline behavior is observed on films grown on 001-MgO substrate. However NSMO films grown on 001-$LaAlO_3$ substrate are found to be in single crystal form with epitaxial like growth. The ferromagnetic T_C and metal-insulator transition temperature (T_{MI}) are found to increase with film thickness due to the relaxation of lattice strain. These films exhibit a maximum negative magneto-resistance of 96% for an applied field of 5T.

The bilayer films of NSMO/NNMO were successfully deposited on 001-LAO substrate by varying NSMO film thickness. All bilayer films show a broad ferromagnetic transition and the T_C is found to increase with film thickness. Electrical resistivity data show the metal-insulator (M-I) transition with the maximum M-I transition temperature, T_{MI} of 172 K for thicker bilayer films.

Bilayer LSMO/LFO films were grown on 001-LAO substrate by varying LSMO layers thickness in the range of 30 nm to 200 nm. They all exhibit ferromagnetic and metal-insulator transition and the T_C & T_{MI} values are found to increase with film thickness. The ferromagnetic resonance peak is found to shift towards lower field with increase in film thickness due to enhanced ferromagnetic interaction. The out-of-plane spectra shows double resonance due to the presence of two different ferromagnetic phases. Thus it is found that both in single layer and bilayer films, the substrate induced lattice strain plays a major role in tuning the electrical and magnetic properties.