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Effect of Oxygen Pressure on Structural and Magnetic Properties of Nd_2NiMnO_6 Thin Films Grown on Different Substrates

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Double perovskites have been studied extensively in the bulk form however very few reports are available on their thin films. Here we are presenting results on first time grew thin films of double perovskite Nd_2NiMnO_6 (NNMO). We report the comparative structural and magnetic studies of the PLD grown thin films on different substrates i.e. $SrTiO_3$ (STO) and MgO. X-ray diffraction (XRD) profiles show that the film grown on STO is epitaxial whereas it is polycrystalline on MgO substrate. Films on both the substrates were grown at 800 mTorr and 200 mTorr oxygen partial pressure. We observe that the film shows the magnetic behavior similar to the bulk sample. We observe the high-temperature ferromagnetic transition near 192 K along with an additional transition observed in the low temperature region (vicinity of 100 K) in Field cooled (FC) magnetization. Super-exchange interaction between Ni^{2+}-O-Mn^{4+} is attributed to the ferromagnetic ordering in these samples. Mixed valence states Ni^{3+} and Mn^{3+} present in the films leads to antiferromagnetic (AFM) interactions which attributes to the appearance of low temperature magnetic transition. The oxygen pressure applied while growing the thin films was found to affect the magnetic moment of NNMO films significantly.

Keywords: Double perovskite, Thin film, Magnetization and Pulsed laser deposition