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EFFECT OF Nd SUBSTITUTION ON ELECTRICAL TRANSPORT AND MAGNETORESISTIVE PROPERTIES OF $La_{2/3}Ba_{1/3}MnO_3$

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ABSTRACT

Polycrystalline semples of $(La_{1-x}Nd_x)_{2/3}Ba_{1/3}MnO_3$ with x = 0.0, 1/6, 1/3, ½, 2/3, 5/6 and 1.0 have been prepared using solid state reaction. The metal-insulator transition (T_P) temperatures were determined by using the standard four-point probe resistivity measurement in a temperature range of 30K to 300K. T_p shifted to lower temperatures with the increase of Nd doping. On analyzing the data by using several theoretical models, it has been concluded that the metallic (ferromagnetic) part of the resistivity (ρ) below T_P fits well with the equation $\rho = \rho_0 + \rho_2 T_2 + \rho_{4.5} T_{4.5}$, indicating ρ_0 is due to the grain/domain boundary effects. A second term ~ $\rho_2 T_2$ appears might be attributed to electron–electron scattering and second-order electron–magnon scattering term ~ $\rho_{4.5} T_{4.5}$. The magnetoresistance (MR) effects are measured using the four point probe technique. The magnetoresistance defined as MR% = $(R_0 - R_H)/R_H \times 100$ was measured at magnetic fields H $\leq$ 1T at 90K, 150K, 250K and 300K. Overall, MR drops slowly when temperature rises. All doping concentration gives small variation range (~8.28% to ~56.53%). The highest MR value of ~56.53 % was measured at 1Tesla, at 100K for sample of x = 1.0.). At Low Field Magnetoresistance (LFMR), the highest gradient of MR is 125.35% MR/Tesla for sample x=0.0 at temperature 90K. The LFMR decreases prominently with increasing doping amount, while the HFMR is increased.

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