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Magnetic and Magneto-Transport Properties of the Sb Doping Mn Site in $La_{0.67}Ba_{0.33}Mn_{1-x}Sb_xO_3$ (0.03 and 0.07) Manganites

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Abstract

We investigate the effect of Sb^{5+} doping at Mn-site in $La_{0.67}Ba_{0.33}Mn_{1-x}Sb_xO_3$ (LBMO-Sb_x) on the magnetic and magneto-electrical properties. The variation of the magnetization M versus temperature T, under an applied magnetic field of 0.05 T, reveals a ferromagnetic–paramagnetic transition for all samples. The resistivity and magneto-transport measurements are performed using standard four-probe assembly with and without magnetic fields. The temperature dependence of electrical resistivity shows that all samples undergo a sharp metal–semiconductor (M–SC) transition at a temperature ($T_{M–SC}$), accompanying the ferromagnetic–paramagnetic transition. The peak resistivity ρ_{max} is noted at the metal–semiconductor transition temperature ($T_{M–SC}$) and lowering in $T_{M–SC}$ is observed for higher concentrations of Sb^{5+}. The resistivity data have been analyzed in two parts. Firstly, in the metallic region below $T_{M–SC}$ the resistivity data is fitted with three degree polynomial. Secondly, in the semiconducting region above $T_{M–SC}$ data have been fitted with Small Polaron Hopping models. Above all, the magnetoresistance study showed a peak which has a high value around the M–SC transition temperature. The dependence of resistivity on the temperature and magnetic field data is used to deduce the magnetic entropy change.

Keywords Manganites · Substitution effect · Transport properties · Magnetoresistance

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