Magneto-transport studies on La2/3Ba1/3(Mn1–x Alx)O3 for low field sensing applications

ABSTRACT

The magnetic and transport properties of La2/3Ba1/3(Mn1ī x Al x)O3 (x=0·0, 0·1, 0·2, 0·3 and 0·4) compounds, prepared by the solid state reaction, have been investigated. Samples show a metalï insulator transition excluding the sample x=0·0. With increased Al doping, the metalï insulator transition temperature T p is shifted to lower temperatures. Grain size reduction leads to a larger resistivity and a decrease in T p. Upon analysing the data using several theoretical models, it was found that the metallic (ferromagnetic) part of the resistivity ȷ (below T P) fits well with the equation ȷ=ȷ 0+ȷ 2 T2, where ȷ 0 is due to the importance of grain/domain boundary effects, and a second term ȷ 2 T2 might be attributed to the electronï electron scattering. The microstructure results indicate that the porosity of the samples increased when the concentration increased. The magnetoresistance (MR) is defined as %MR=100×[ȷ(H,T)ï ȷ(0,T)]/[ȷ(0,T)], where ȷ(H,T) and ȷ(0,T) are the resistivities at temperature T, with an applied magnetic field H and zero applied magnetic field respectively. All samples show low-field magnetoresistance and high-field magnetoresistance regions. The highest percentage of LFMR at a temperature of 100 K is ~210% MR/Tesla, measured for the sample x=0·2. For x=0·3, the sample reveals the highest colossal magnetoresistance value among other doped compounds with 27·27% at 100 K.

Keyword: Metalï insulator transition temperature Tp; Resistivity; Low-field magnetoresistance