

Electrical and magnetic properties of Ga substituted La_{2/3} Ca_{1/3} MnO₃ perovskite

ABSTRACT

Electrical and magnetic properties of gallium substitution for calcium in ABO₃ typed colossal magnetoresistance (CMR) La_{2/3}Ca_{1/3}MnO₃ (LCMO) perovskite were studied using DC four point probe and AC susceptometer. La_{2/3} (Ca_{1-x}Ga_x)_{1/3}MnO₃ (LCGMO) samples of concentration of $x = 0.6, 0.7$ and 0.8 were prepared using the solid state reaction method. Gallium substituted samples show the effect of decreasing Mn⁴⁺ concentration and of lattice distortion by incorporation of smaller gallium ionic radius. Electrical transport studies indicate samples with Ga concentration $x=0.6$ and 0.7 exhibit metal to insulator transition (MIT) at low temperature (50K) and sample $x=0.8$ only shows insulating behavior with increasing Ga concentration. AC susceptibility studies indicate all samples exhibit ferromagnetic to paramagnetic transition with an antiferromagnetic ordering at low temperature showing the effect of decreasing Mn⁴⁺ concentration affecting double exchange mechanism and thus magnetic ordering of the samples.

Keyword: Perovskite; Spin glass; Susceptibility