Structure, electrical transport and Magneto-Resistance properties of La5/8Ca3/8MnO3 manganite synthesized with different manganese precursors.

ABSTRACT

We synthesized the polycrystalline manganite of La5/8Ca3/8MnO3 with three different manganese routes prepared through a solid state reaction method. The effects of the manganese route selection on the structure, electrical transport and magneto-transport properties were examined in this study. The samples were characterized using X-ray diffraction (XRD) and SEM to identify their structure and morphology. XRD analysis confirmed that all samples were in single phase with orthorhombic structure and belonged to the Pnma space group. The average grain sized samples with manganese route of Mn2O3 and MnCO3 had a grain size of 1.2–8.7 μm and 2–7.5 μm, respectively. For the MnO2 route, the sample had a small melt-like shape with higher porosity. The metal–insulator transition temperature, TMI, for LCMO (Mn2O3), LCMO (MnO2) and LCMO (MnCO3) samples were 270 K, 266 K and 258 K, respectively. All the samples showed negative magneto-resistance with significant increase in value near the TMI temperature. The highest CMR (colossal magneto-resistance) ratio was found in LCMO (Mn2O3), -22.06% at 270 K, followed by -16.69% for LCMO (MnO2) at 80 K, and 15.2% for LCMO (MnCO3) at 100 K in a 1 T magnetic field.

Keyword: Magneto-resistance; Manganite; Grain boundary; Metal-insulator transition temperature.