

Magneto-Resistance Enhancement due to Self-Hole-Doping in LaMnO_3 produced by Low Temperature Heat Treatment

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As respects the spin dependent conduction, we have observed the magneto-resistance (MR) enhancement due to self-hole-doping (SHD) in LaMnO_3 (LMO) produced by low temperature heat treatment (LTHT). The LMO polycrystalline samples were produced by solid-state-reaction, using stoichiometrically mixed powders of La_2O_3 and Mn_2O_3 . After the calcination at 1100°C for 18 hours under oxygen gas flow (OGF) and grinding, the powders were pressed into pellets and were sintered at 1100°C and 1300°C under the OGF. Although the bulk single crystal of LMO is almost insulator, our LMO samples showed large electrical conductivity due to the SHD and especially the sample sintered at 1100°C indicated the metallic conduction. We consider that during the sintering process in sufficient oxygen gas atmosphere, excess oxygen was primarily introduced into the grain boundary regions (GBR), which were amorphous-like, in LMO and the SHD was mainly caused in the GBR. The LTHT generated large GBR in LMO and itinerant holes shows the strong spin scattering in the absence of magnetic field. Therefore we consider that the MR enhancement was observed in LMO samples produced by the LTHT.