SA01

Magnetic and Electronic Properties of $La_{0.7}Ca_{0.3}Mn_{1-x}V_xO_3$

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The magnetic and the electronic properties of colossal mangnetoresistance (CMR) materials, particularly, $La_{0.7}Ca_{0.3}Mn_{1-x}TM_xO_3$ (TM = transition metal : V)have been investigated. The CMR phenomena have been understood onbasis of double-exchange interaction due to the hopping of e_g electrons between Mn sites, promoting the ferromagnetic order, and the strong electron phonon coupling arising from the Jahn-Teller splitting of Mn 3*d* levels. In common, the CMR properties can be significantly influenced by transition-metal ions into the Mn sites. The doping at the Mn site in perovskite manganites causes change in the electronic structure ofMn ion and a magnetic coupling between dopant and Mn. Heavy doping with V, that is, $0.1 < x < 0.2$, induces two distinct magnetic transitions. Thisindicates the reentrant character, andresultsin the growth of ferromagnetic insulating phase, due to the localization of charge carriers and the ferromagnetic metallic clusters. The magnetic relaxation also occurs in both the reentrant spin-glass and the high-temperature ferromagnetic regions.

SA02

Effect of Structure Peculiarities on Magnetotransport Properties of the Ba-doped Nanomanganites

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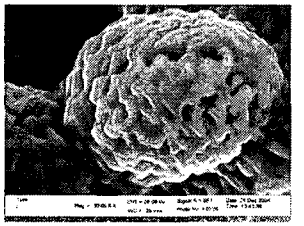
The effect of the morphology and A-site ionic ordering on magnetotransport properties of the $Nd_{0.7}Ba_{0.3}MnO_{3+\delta}$ system has been investigated. The high-quality stoichiometric $Nd_{0.7}Ba_{0.3}MnO_3$ solid solution has been obtained in air at 1400°C. The A-site disordered $Nd_{0.7}Ba_{0.3}MnO_3$ sample is orthorhombic ferromagnet below T_C~151K. It is established that the annealing in vacuum $P[O_2]$~10^{-4}Pa at T=800°C temperature leads to the decomposition of the solid solution into Nd_2O_3, MnO as well as $NdBaMn_2O_5$ phases and the formation of nanometric ~100nm grains (see fig.). The anion-deficient A-site ordered $NdBaMn_2O_5$ phase is tetragonal ferrimagnet with T_N~130K [1].



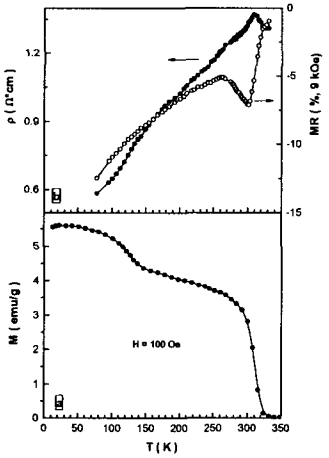


Fig. The microstructure, magnetization and resistivity with magnetoresistance for the nanosized $Nd_{0.7}Ba_{0.3}MnO_3$ sample.

The structure of the anion-deficient phase consists of pyramidal Mn^{2+}/Mn^{3+} layers, sandwiched between alternating Nd^{3+} oxygen-free and Ba^{2+} oxygen-filled layers. The following annealing of the reduced multiphase sample in air at T=800°C does not change the size of the nanograines of composite product which consists from two phases : (i) A-site ordered $NdBaMn_2O_6$ one which has tetragonal symmetry of the unit cell and Curie point ~317K and (ii) superstoichiometric $NdMnO_{3+\gamma}$ one which has orthorhombic symmetry of the unit cell and Curie point ~ 140K. For the A-site ordered phase the Nd^{3+} and Ba^{2+} ions are equally arranged in alternating (001) planes of the perovskite structure. The magnetoresistance of the nanosized $Nd_{0.7}Ba_{0.3}MnO_3$ sample at the T~293 K is about 7% in field of 9kOe. Nanosized effect produces the reduction of the unit cell and as consequence the increase of intensity of exchange interactions between Mn^{3+} and Mn^{4+} ions. A decrease in the grain size to the nanodimensional level is accompanied by a certain decrease in the unit cell volume, which is explained by an increase in the forces of surface tension relative to the bulk elastic forces Such considerable changes of the magnetic properties are interpreted in frame of the A-site ordering [2] and the formation of nanometric grains [3], which are exchange coupled with each other.

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