

Influence of La defect on the magnetoresistance and magnetic properties of $\text{La}_{1-x}\text{MnO}_3$

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Influence of the effect of lanthanum deficiency on the structural, magnetoresistance, and magnetic properties have been studied on a series of $\text{La}_{1-x}\text{MnO}_3$ ($x=0, 0.05, 0.1, 0.2,$ and 0.33) powder samples. The powder samples were prepared by the sol-gel method. The x-ray diffraction analyses of the samples revealed a single phase of rhombohedral symmetry. Magnetization curves showed a weak ferromagnetic ordering for the sample $x=0.0$ with its Curie $T_C=138$ K, but for the other samples showed ferromagnetic phase. The Curie temperature T_C , with increasing deficiency from $x=0.05$ to $x=0.33$, was found to be increased from 272 to 279 K, respectively. The saturation magnetic moments per Mn atom at 80 K for $x=0.0$ and 0.10 are 2.30, 3.21 μ_B , respectively. A small increasing La defects resulted in changes of their magnetic structures thoroughly. In all the La defect samples, the temperature dependence of resistance shows that metal to insulator transition occurs near the T_C and is closely related to the magnetization. The magnetoresistance value of 30% [$\Delta\rho/\rho(0)$] has been obtained at 272 K under $H=1.5$ T for the sample $x=0.1$. The evidence for the formation of double exchange is also shown in x-ray measurements. © 2001 American Institute of Physics. [DOI: 10.1063/1.1362652]