

Electrical, magnetoresistance and magnetotransport properties of Nd_{1-x}Sr_xMnO₃

ABSTRACT

The effects of Sr substitution on the electrical, magnetoresistance and magnetotransport properties of Nd_{1-x}Sr_xMnO₃ were studied. Nd_{1-x}Sr_xMnO₃ samples were prepared using the solid-state reaction method with $x=0.12, 0.152, 0.22, 0.252$ and 0.32 . All samples showed an orthorhombic structure, and no impurities were detected when the samples were examined using the X-ray diffraction method. The grain size was between $10\ \mu\text{m}$ and $16\ \mu\text{m}$ for all samples. The sample with $x=0.32$ showed the smallest grain size and the lowest T_0 value, where T_0 reflects the MnOMn bond angle. As the Sr concentration increased, the grains grew into more pentagonal and hexagonal shapes, and the insulator–metal transition temperature, T_{im} , also increased from $131\ \text{K}$ to $180\ \text{K}$. The exceptions were the samples with $x=0.152$ and 0.252 , where charge ordering was found at $120\ \text{K}$. The samples with the most pentagonal and hexagonal shaped grains ($x=0.32$) had the highest T_{im} . The magnetoresistance (MR) values were found to increase with increasing magnetic field. The sample with $x=0.32$ showed the highest MR value (31.5%), the highest T_{im} , the smallest grain size ($\sim 10\ \mu\text{m}$) and the least bending of the MnOMn bonding angle.

Keyword: Grain size; Electrical properties; Magnetic properties.