

Structure and Properties of $(\text{La}_{2-x}\text{Sr}_x)\text{MnO}_4$ Compounds

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Abstract

Polycrystalline single phase $(\text{La}_{2-x}\text{Sr}_x)\text{MnO}_4$ ($1.10 \leq x \leq 1.40$) samples were prepared by a citrate precursor method. They have tetragonal K_2NiF_4 structure with a space group of $14/mmm$, increasing x , unit-cell a -axis increases and c -axis decreases, which is a result of decreasing of the Jahn-Teller effect due to the increase of the Mn(IV) ion. Spin glass state exists at low temperature and a hump observed from the susceptibility (χ) measurement is probably caused by the interactions of several magnetic phases. Among them, $(\text{La}_{0.6}\text{Sr}_{1.4})\text{MnO}_4$ has the largest magnetoresistance ratio ($[\rho(H) - \rho(0)]/\rho(0)$), which reaches to 78.4% at 48 K. It is not possible to obtain single phase materials with $0.60 \leq x \leq 1.00$ in the heat treatment temperature range of $1000\text{-}1600^\circ\text{C}$. Impurities were easily observed under SEM and X-ray diffraction patterns. Increasing the heating period and decreasing the temperature, the amount of ABO_3 perovskite phase increases. In order to extend the solubility range, of the SrO in the $(\text{La}_{2-x}\text{Sr}_x)\text{MnO}_4$, it probably needs a higher temperature ($>1600^\circ\text{C}$) and a shorter heat treatment period (<1 h).

Key words : $(\text{La}_{2-x}\text{Sr}_x)\text{MnO}_4$; Magnetoresistance; K_2NiF_4 structure; Jahn-Teller effect; Preparation