Co-existence of Two Structural Phases in Equilibrium in $La_{1-x}Sr_xMnO_3$ at x=0.1-0.4

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Colossal magneto-resistive $La_{1-x}Sr_xMnO_3$ (LSMO) has drawn scientific interest because of its complex phases at x=0.1-0.4, which is not clearly resolved yet. This paper examines the phases at the composition range using neutron powder diffraction and transmission electron microscopy (TEM). The terminal phase at x<0.1 is orthorhombic ($Pnma$). In the sample of x=0.1, however, Rietveld analysis [1] of neutron powder diffraction detects rhombohedral phase ($R\bar{3}C$, 4%) in the orthorhombic ($Pnma$, 96%) matrix. The rhombohedral phase increases to 56% at x=0.18 and 100% at x> 0.3. Selected area diffraction (SAD) of TEM also confirms the existence of two phases. The results indicate that the two phases of LSMO are in equilibrium in a wide composition range of about x=0.1-0.25.

References

[1] R. A. Young, The Rietveld Method, (Oxford University Press, Oxford, 1993)