Comparative Study of Phase Transitions in Ga-, Zn-, Ni-, Ti-substituted La-Sr Manganites

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The aim of the study is to examine the influence of substituting ion on the position of phase boundaries "rhombohedral-orthorhombic structure" and "semiconductor-metal" in comparison with classical phase diagrams established earlier for La\textsubscript{1-c}Sr\textsubscript{c}MnO\textsubscript{3} system.

Experimental data are shown for ceramic samples of La-Sr manganites with substitution of Mn by Ga-, Zn-, Ni-, and Ti in specifically designed systems: La\textsubscript{1-c}Sr\textsubscript{c}Mn\textsubscript{1-x}Ga\textsuperscript{3+}\textsubscript{x}O\textsubscript{3}, La\textsubscript{1-c}Sr\textsubscript{c}Mn\textsubscript{1-x}Zn\textsuperscript{2+}\textsubscript{x}O\textsubscript{3}, La\textsubscript{1-c}Sr\textsubscript{c}Mn\textsubscript{1-x}Ni\textsuperscript{2+}\textsubscript{x}O\textsubscript{3}, La\textsubscript{1-c}Sr\textsubscript{c}Mn\textsubscript{1-x}Ti\textsuperscript{4+}\textsubscript{x}O\textsubscript{3}. Under the condition that concentration of oxygen is stoichiometric, the content of Mn\textsuperscript{4+} (f.u.) is equal to the value of "c", and is independent of x in these systems.

Bulk manganites (c=0.15, 0.17, 0.19, 0.20; 0.025 ≤ x ≤ 0.125 were prepared by solid state reactions in air. Then, in order to provide stoichiometric oxygen content, the samples were processed at 1223 K and corresponding partial pressure of oxygen. It was found that divalent substituting ions shifted boundary "rhombohedral-orthorhombic structure" to higher values of "c", while Ga\textsuperscript{3+} and Ti\textsuperscript{4+} shifted it in opposite direction. The regularities of the influence of substituting ions concentrations on saturation magnetization, Curie point, resistivity and magnetoresistance were established.

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