Synthesis, Nuclear structure, and Magnetic Properties of Some Doped Perovskites

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The compositions and purity of polycrystalline powder samples of $Nd_{0.7}Sr_{0.3}$ Mn_{1-x} Mg_xO_3 (x = 0.0, 0.1, 0.2, 0.3), $LaCr_{1-x}Mn_xO_3$ (x = 0.0, 0.1, 0.2, 0.3) and La_{1-x} Nd_x $Cr_{0.5}$ $Mn_{0.5}$ O_3 (x = 0.0, 0.15, 0.2) were characterized by X-ray diffraction and chemical analysis. The magnetic properties were investigated by neutron powder diffraction technique and magnetization measurement using a SQUID.

All the structures studied have orthorhombic structure, space group Pnma, in a wide range of temperatures. The Mg-substitution in $Nd_{0.7}Sr_{0.3}Mn_{1-x}Mg_xO_3$ creates only small distortions in the nuclear structure. The magnetic properties of the compounds, however, are significantly affected by Mg- substitution.

All the samples of nominal composition $LaCr_{1-x}Mn_xO_3$ have orthorhombic structure with space group Pnma at temperatures between 1.5 and 400 K. However, at 600 K, all samples are found to have rhombohedral structure with space group R-3c. The magnetic properties of the system are markedly affected by Mn-substitution. The parent compound, $LaCrO_3$, is purely G-type antiferromagnetic with Neel temperature at about 300 K. With increasing Mn-substitution, gradually, a ferromagnetic component develops in the system, thereby leading to the occurrence of canted magnetic moment.

The magnetic structure of La_{1-x} $Nd_xCr_{0.5}Mn_{0.5}O_3$ is antiferromagnetic, G-type, from room temperature down to 10 K. A small ferromagnetic component appears at the lowest temperatures.

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