

Magnetoresistive and Magnetic Properties of RF-Magnetron Sputter Deposited La-Ca, Sr-Mn-O Films

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Abstract—Epitaxial and polycrystalline La-Ca, Sr-Mn-O thin films about 1000 Å thick were grown on LaAlO₃(100), MgO(100) and SiO₂/Si(100) substrates by RF magnetron sputtering. Changes in the resistivity and magnetoresistance of the films on LaAlO₃(100) substrate were investigated as the Ca and Sr ratio was varied. The crystal structure of La-Ca,Sr-Mn-O films were determined to be orthorhombic perovskite. Lattice constant of crystalline La_{0.82}Ca_{0.1}Sr_{0.08}MnO₃ film were $a_0 = 5.466$ Å, $b_0 = 5.392$ Å, $c_0 = 7.725$ Å. When the amount of Sr was increased, results of x-ray diffraction patterns show no appreciable change of the lattice parameter. However, the semiconductor-metal transition temperature (T_{SC-M}) of the epitaxial films on LaAlO₃(100) increased and the resistivity decreased as the amount of Sr was increased. For the epitaxial La_{0.82}Ca_{0.1}Sr_{0.08}MnO₃ film on LaAlO₃, the temperature dependence of the resistivity under zero and 1.5 T applied fields showed that semiconductor-metal transition occurs at 246 K and the relative maximum magnetoresistance ratio was about 172% at 230 K.

Index Terms—Colossal magnetoresistance, epitaxial film, perovskite.

