

Characterization of La-Sr-Mn-O Films on Si(100) Grown by Using an rf-Sputtering Process under Different O₂ Partial Pressures

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La-Sr-Mn-O thin films were prepared by using an rf-sputtering process with a La_{0.67}Sr_{0.33}MnO₃ ceramic target. The conditions for deposition of La-Sr-Mn-O thin films on Si(100) substrates were that the oxygen partial pressure of the buffer gas was 0, 20, 40, and 60 % at an rf-magnetron sputtering power of 2.46 W/cm² and a substrate temperature of 700 °C. After the deposition, all films were annealed in an O₂ atmosphere for 1 hour at 800 °C. The chemical composition, the crystal structure, the magnetic properties, the surface, and the ionic state of the Mn ion for the La-Sr-Mn-O films were studied using X-ray diffraction, Rutherford backscattering spectroscopy, atomic force microscopy, scanning electron microscopy, and X-ray photoelectron spectroscopy. The crystalline La-Sr-Mn-O thin films grown on Si(100) showed a perovskite monoclinic structure. In the case of $P_{O_2} = 20\%$, the chemical composition was La_{0.85}Sr_{0.15}MnO₃ with the lattice parameters $a_0 = 5.489 \text{ \AA}$, $b_0 = 5.517 \text{ \AA}$, $c_0 = 7.769 \text{ \AA}$, and $\beta = 89.07^\circ$. As the O₂ partial pressure decreased, the root mean square roughness and the thickness of the La-Sr-Mn-O films increased.