

Annealing effect on the magnetoresistance in $\text{La}_{0.75}\text{Ca}_{0.25}\text{MnO}_3$ thin films grown on Si (100) substrates

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Polycrystalline $\text{La}_{0.75}\text{Ca}_{0.25}\text{MnO}_3$ thin films have been grown by rf magnetron sputtering on Si (100) substrates. The physical properties (lattice parameter, transition temperature, and activation energy) of the thin films were changed after annealing in oxygen. We obtained significantly improved magnetoresistance (MR) ($\Delta\rho/\rho_0$) values with the annealed films; 0.34, 0.29, and 0.27 at 1.5 T field for the films with deposition temperatures 700 °C, 750 °C and 800 °C, respectively. We investigated the effect of the out-of-plane lattice parameters on MR and transition temperature. Annealing effect on the change of the physical properties is discussed for the films. We suggest that oxygen refilling decreases the Mn–O–Mn bond angles as well as increases $\text{Mn}^{4+}/\text{Mn}^{3+}$ ratio. As a result, both out-of-plane lattice parameter and resistivity are reduced, while activation energy and the metal–insulator transition temperature are increased. © 2002 American Institute of Physics.

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