Colossal magnetoresistance effect in epitaxially grown $La_{2/3}Ca_{1/3}MnO_3$ perovskite-like manganite thin films

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Abstract

We report in this work, study on colossal magnetoresistance (CMR) effect in epitaxial $La_{2/3}Ca_{1/3}MnO_3$ thin films grown on $SrTiO_3$ (0 0 1) substrates by pulsed laser deposition (PLD) technique. The films were grown on as-received $SrTiO_3$ substrates and on $SrTiO_3$substrates prepared by HF etching (Koster et al., Appl. Phys. Lett. 73 (1998) 2920; V. Leca et al., Wet etching methods for perovskite substrates, University of Twente, MESA+ Research Institute, Low Temperature Division). Two of the samples were annealed in different conditions to investigate the films heat treatment effect on electric and magnetic properties. Electrical resistance was done using the four-probe method at temperatures in the range of 2–375 K without a magnetic field and in an external field of 5 T applied in the film plane. Resistance-magnetic field (R vs. H) at 77 K for the two annealed samples was done in a 5 T sweep magnetic field. The surface morphology and structural information of the films were obtained using atomic force microscopy (AFM) and X-ray diffraction (XRD), respectively. Secondary ion mass spectroscopy (SIMS) analysis was performed on the annealed samples to investigate any possible chemical reaction between $La_{2/3}Ca_{1/3}MnO_3$ thin films and $SrTiO_3$ substrate.

Keywords

- Thin film;
- Manganites;
- Perovskite;
- Colossal magnetoresistance effect