

Growth and characterization of La₅/8Sr₃/8MnO₃ thin films prepared by pulsed laser deposition on different substrates

ABSTRACT

Colossal magnetoresistance La₅/8Sr₃/8MnO₃ (LSMO) thin films were directly grown on MgO(100), Si(100) wafer and glass substrates by pulsed laser deposition technique. The films were characterized using X-ray diffraction (XRD), field emission-scanning electron microscope and atomic force microscopy (AFM). The electrical and magnetic properties of the films are studied. From the XRD patterns, the films are found to be polycrystalline single-phases. The surface appears porous and cauliflower-like morphology for all LSMO films. From AFM images, the LSMO films deposited on glass substrate were presented smooth morphologies of the top surfaces as comparing with the films were deposited on Si(100) and MgO(100). The highest magnetoresistance (MR) value obtained was -17.21 % for LSMO/MgO film followed by -15.65 % for LSMO/Si and -14.60 % for LSMO/Cg films at 80 K in a 1T magnetic field. Phase transition temperature (TP) is 224 K for LSMO/MgO, 200 K for LSMO/Si and above room temperature for films deposited on glass substrates. The films exhibit ferromagnetic transition at a temperature (TC) around 363 K for LSMO/MgO, 307 K for LSMO/Si and 352 K for LSMO/Cg thin film. TC such as 363 and 352 K are the high TC that has ever been reported for LSMO films deposited on MgO substrate with high lattice mismatch parameter and glass substrates with amorphous nature.

Keyword: Thin films; Pulsed laser deposition technique; X-ray diffraction