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Structural and Magnetic Characterization of Fe-doped La$_{2/3}$Ca$_{1/3}$MnO$_3$ Films

OSCAR LUIS ARNACHE OLMOS, Universidad de Antioquia, AXEL HOFFMANN, MSD, Argonne National Laboratory, DORIS A. GIRATA LOZANO, Universidad de Antioquia — We have investigated pure and $^{57}$Fe-doped La$_{2/3}$Ca$_{1/3}$MnO$_3$ thin films, which were prepared via high O$_2$-pressure (500 mTorr) by magnetron DC sputtering on (100) LaAlO$_3$, (100) SrTiO$_3$ and (100) MgO substrates. The $^{57}$Fe-doped samples contained 1% and 3% $^{57}$Fe per Mn. The structural and magnetic properties of the films and targets were characterized using X-ray diffraction (XRD) and reflectivity, Mössbauer spectroscopy and magnetometry measurements. XRD shows that films are single phase and epitaxially oriented, and have negligible structural changes upon $^{57}$Fe-doping. The Mössbauer spectra measured at room temperature exhibit one doublet with an isomer shift of 0.320±0.003 mm/s, indicating the presence of the Fe$^{3+}$ ion at room temperature in the sample, which is a typical value of the high-spin of Fe$^{3+}$ with octahedral coordination. The quadrupole splitting value was 0.210±0.006 mm/s. This clearly indicates that Fe is incorporated into the structure by substituting Mn. We will furthermore discuss the influence of $^{57}$Fe-doping on magnetic and magnetotransport properties.

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