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Sol-Gel Synthesis and Transport Properties of $La_{2/3}Sr_{1/3}Mn_{0.99}{}^{57}Fe_{0.01}O_3$ Granular Thin Films

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We have used acetic acid, ethanol and distilled water as a solvent to synthesize $La_{2/3}Sr_{1/3}Mn_{0.99}{}^{57}Fe_{0.01}O_3$ (LSMFO) precursor. Crack-free LSMFO granular polycrystalline thin films have been deposited on thermally oxidized silicon substrates by spin coating. The dependence of crystallization, surface morphology, magnetic and transport properties on annealing temperature was investigated. With increasing annealing temperature, the metal-semiconductor (insulator) transition temperature and the magnetic moment decrease while the resistivity increases. The lattice constants remain almost unchanged. For LSMFO thin films, spin-dependent interfacial tunneling and/or scattering magnetoresistance were observed. Our results indicate that the annealing temperature is very important in determining the intrinsic and extrinsic magnetotransport properties.