Charge Transfer and Lattice Distortion in strained La$_{0.7}$Ca$_{0.3}$MnO$_3$ and La$_{0.8}$Ba$_{0.2}$MnO$_3$ Films on SrTiO$_3$ Substrate

CHUN-BIN WU, F.P. YUAN, X.G. XU, HSIUNG CHOU$^1$, Department of Physics, National Sun Yat-Sen University — Lattice mismatches between La$_{0.67}$Ca$_{0.33}$MnO$_3$ (LCMO $a = 3.86$) and La$_{0.8}$Ba$_{0.2}$MnO$_3$ (LBMO $a = 3.89$) CMR thin films and the substrate SrTiO$_3$ ($00l= 3.905$) induce a strong tensile strain that expands the in-plane lattice and shortens the out-of-plane lattice of films. The magnetic transition temperature ($T_c$) and the metal-insulator transition temperature ($T_{MI}$) are then suppressed dramatically in LCMO films and are raised in LBMO films. The possible causes of the contrary phenomena are examined by X-ray diffraction and HRXRD which indicate that the change of $T_c$ or $T_{MI}$ is highly possible due to the distortion in Mn-O-Mn chains, such as the bond length and angle, that induced the variation of orbital stability and the charge transfer in itinerant $e_g$ band.

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