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Low spin to high spin phase transition in ultrathin film of La_{0.7}Sr_{0.3}MnO₃/SrTiO₃ HONGYAN CHEN, HANXUAN LIN, HAO LIU, PENG CAI, TIAN MIAO, YANG YU, YU BAI, ZHE WANG, Fudan University, YONGSHENG ZHANG, YAN LI, Institute of Physics, Chinese Academy of Sciences, YING XU, WENBIN WANG, RUQIAN WU, Fudan University, ZHAOHUA CHENG, Institute of Physics, Chinese Academy of Sciences, CHUANSHAN TIAN, LIFENG YIN¹, JIAN SHEN², Fudan University — Ultrathin films of manganites often exhibit dramatically different physical properties with respect to the thicker films and the constituent bulk material. Here, we have studied the spin structure of La_{0.7}Sr_{0.3}MnO₃ (LSMO) ultrathin films grown on SrTiO₃ (001) substrate, which remains unresolved till date. Combining results from thickness-dependent magneto-optical Kerr effect and scanning tunneling spectroscopy measurements, we have obtained a full phase diagram of the spin structure of the LSMO ultrathin films. Specifically, the LSMO films are in a low-spin magnetic phase from 4 unit cells to 7 unit cells. Above 9 unit cells, the whole films transform into ferromagnetic metallic state. At the critical thickness of 8 unit cell, the film exhibits an interesting surface spin state that mediates the low-spin to high-spin transition.

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