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Ferromagnetic Spin State of Manganite/SrTiO$_3$ Interfaces in (110) Orientation XINFEI LIU, JIANXING MA, TAO LIN, Department of Physics, University of California, Riverside, G. Y. GAO, W. B. WU, X. G. LI, Hefei National Laboratory for Physical Sciences at Microscale, University of Science and Technology of China, JING SHI, Department of Physics, University of California, Riverside — The interface spin state of a ferromagnet (FM) can deviate significantly from its bulk spin state and this effect could be strongly orientation-dependent especially in manganites. We have successfully fabricated high-quality (110)-oriented [La$_{0.7}$Sr$_{0.3}$MnO$_3$ (t) /SrTiO$_3$ (3ML)]$_n$ superlattices (t ranging from 3 to 15 ML), which are characterized by the atomic force microscopy, high-resolution transmission electron microscopy, x-ray diffraction and magnetometry. Compared to (100)-oriented counterparts, LSMO in (110)-oriented superlattices has a thinner deadlayer at LSMO/STO interface. From the thickness (t) dependence of the superlattice magnetic moment, we extract the interface contribution and find that the interface moment is close to that of the bulk, suggesting that the (110)-oriented interface adopts the FM spin ground state. This differs significantly from the spin canting state at (100)-oriented LSMO/STO interface that was previously reported by other groups. Our results indicate that the magnetism of manganite interface may be manipulated by taking advantage of the orientation-dependent nature of the exchange interactions.

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