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Interface Structures in Ferromagnetic $LaMnO_3$-$SrMnO_3$ Superlattices AMISH SHAH, Arizona State University, QUENTIN RAMASSE, SuperSTEM Laboratory, UK, STEVEN MAY, ANAND BHATTACHARYA, Argonne National Laboratory, XIAOFANG ZHAI, JAMES ECKSTEIN, JIAN-MIN ZUO, University of Illinois at Urbana-Champaign, JOHN SPENCE, Arizona State University — We have investigated the interfaces of $LaMnO3_{2n}$-$SrMnO3_n$ (LMO/SMO) superlattices. Charge density calculations have predicted a leakage of Mn e_g electrons from LMO into SMO.[1] For n=1, these electrons are expected to be distributed throughout all films in the superlattice, while for $n > 3$, the electrons are expected to be localized within a few layers near the interfaces. Using aberration corrected STEM coupled with EELS, we probed a $LMO_{11.8}$-$SMO_{4.4}$ superlattice at high spatial resolution to examine interfacial states. We find that the LMO on SMO interface is structurally sharper than SMO on LMO interfaces. Extra interfacial states above the Fermi level are localized to 1 unit cell of the sharp LMO/SMO interface while the states are weak or absent at the rougher SMO/LMO interfaces. The same interfaces that have extra states have an enhanced ferromagnetic moment at low temperatures.[2]

[1]C. Aruta et al., Phys. Rev. B 80 (2009).
[2]S. May et al., Phys. Rev. B 77 (2008).

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