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Transport and magnetic properties of digital superlattices of $(LaMnO_3)_{2n}/(SrMnO_3)_n$. A. BHATTACHARYA, Materials Science Division (MSD), Argonne National Laboratory (Argonne), J. KAVICH, Department of Physics (Physics), University of Illinois, Chicago (UIC) and Advanced Photon Source (APS), Argonne, S.G.E. TE VELTHUIS, MSD, Argonne, X. ZHAI, M. WARUSAWITHANA, Physics, University of Illinois, Urbana-Champaign (UIUC), J. FREELAND, APS, Argonne, SAM BADER, MSD, Argonne, J.N. ECKSTEIN, Physics, UIUC — Superlattices of $(LaMnO_3)_{2n}/(SrMnO_3)_n$, n=1-5, were synthesized using O_3-assisted MBE. Both constituents are antiferromagnetic insulators at low temperatures. The overall stoichiometry is the same as for $La_{2/3}Sr_{1/3}MnO_3$ random alloys, but the A-site disorder is eliminated. For n=1, 2 a metallic ferromagnetic state is obtained at low T. For n=1, all measured properties are nearly identical to those of the random alloy. The emergence of a metallic state is interpreted in terms of a Mott transition driven by the proximity between $LaMnO_3/SrMnO_3$ interfaces. For $n \geq 3$, a transition to an insulating state occurs, with a suppression of T_C and M_s and an increase in H_c. Using neutron and resonant x-ray scattering, we observe a modulation of the ferromagnetism commensurate with the superlattice period for n=5. We propose that magnetic frustration at the AF/F interfaces drives the insulating state. Ack: DOE BES contract #DE-AC02-06CH11357.

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