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Charge leakage and effective doping of atomically flat $(LaMnO_3)_{2n}$ / $(SrMnO_3)_n$ superlattice interfaces J.J. KAVICH, J.W. FREELAND, Advanced Photon Source, Argonne National Laboratory, Argonne, IL 60439, A. BHATTACHARYA, Materials Science Division, Argonne National Laboratory, Argonne, IL 60439, M.P. WARUSAWITHANA, Department of Materials Science and Engineering, Penn State University, J.N. ECKSTEIN, Department of Physics, University of Illinois at Urbana-Champaign, Urbana IL 61801 — Atomically flat molecular beam epitaxy (MBE) grown interfaces in high quality digital superlattices provide a unique investigation of the role of substitutional disorder in complex oxide systems. Circularly polarized x-rays are used to measure the electronic and magnetic properties of the random alloy $La_{2/3}Sr_{1/3}MnO_3$ as it is digitally ordered into discrete layers of insulating A-type antiferromagnetic $LaMnO_3$ (LMO) and G-type antiferromagnetic $SrMnO_3$ (SMO) with superlattice configurations of $(LMO)_{2n}/(SMO)_n$. The diffusion of carriers across the interface effectively dopes the interface region. The electronic and magnetic structure of the n=1 digital structure is nearly identical to the solid solution of the same doping showing that, on average, the charge distributes uniformly over the entire sample. The ferromagnetic insulating nature of the n = 5 superlattice suggests a finite lengthscale of the diffusion of carriers at the interface. Work at Argonne is supported by the U.S. Department of Energy, Office of Science, under Contract No. DE-AC02-06CH11357.

Jerald Kavich
University of Illinois at Chicago

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