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Electronic reconstruction at $SrMnO_3$-$LaMnO_3$ superlattice interfaces SERBAN SMADICI, PETER ABBAMONTE, Frederick Seitz Materials Research Laboratory, University of Illinois at Urbana-Champaign, IL 61801, USA, ANAND BHATTACHARYA, Argonne National Laboratory, IL 60439, USA, XIAO-FANG ZHAI, JAMES ECKSTEIN, FS MRL, UIUC, IL 61801, USA, ANDRIVO RUSYDI, University of Hamburg, D-20355, Germany — Progress in molecular beam epitaxy made possible the growth of manganese oxide superlattices with the dopant ions arranged in separate regular layers. Little is known about how this "structural" doping is reflected into the MnO_2 planes; for instance what is the plane effective hole concentration. We studied superlattices made of $SrMnO_3$ and $LaMnO_3$ layers with a doping of x=0.33 using resonant soft x-ray scattering. For scattering momenta at which the non-resonant contribution is suppressed by symmetry, i. e. L=3 in units of the superlattice period, resonant soft x-ray scattering probes the distribution of doped holes, and, in particular, the nature of the interface between the doped and undoped layers. Our measurements at the O K edge show a temperature-dependent hole distribution. This electronic reconstruction which occurs with cooling below T_c =220 K is related to the transition of the superlattice to a ferromagnetic state. Resonant scattering spectra at the Mn L edges from spin and orbital distributions have complex shapes providing additional insights into these new materials.

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