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STEM-EELS and theoretical analysis of the electronic structure in cuprate-manganite heterostructures[1] J. SALAFRANCA, J. TORNOS, C. LEÓN, J. SANTAMARÍA, Universidad Complutense de Madrid, Spain, M. VARELA, S.J. PENNYCOOK, Oak Ridge National Laboratory, TN, E. DAGOTTO, University of Tennessee, TN; Oak Ridge National Laboratory, TN — Scanning transmission electron microscopy in combination with electron energy loss spectroscopy allows sub-nanometer scale resolution mapping of the formal oxidation state of the transition metal ions in $YBa_2Cu_3O_{7-\delta}/La_{0.7}Ca_{0.3}MnO_3$ superlattices. The experiments show an unexpected excess of valence electrons near the interface. We compare these results with tight binding model calculations where Coulomb interactions are included within Hartree approximation. Neither the polar catastrophe mechanism nor the mismatch of chemical potentials between the two materials are sufficient to account for the observed profile. We study the effect of oxygen vacancies near the interface and find that they can explain the measured electronic structure.

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