

Abstract Submitted
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Two doped holes with different distributions in $\text{Sr}_2\text{CuO}_{4-\delta}$ – La_2CuO_4 superlattices¹ S. SMADICI, J.C.T. LEE, P. ABBAMONTE, University of Illinois at Urbana-Champaign, IL 61801, USA, A. RUSYDI, National University of Singapore, 11754, Singapore, G. LOGVENOV, Max-Planck-Institut for Solid State Research, D-70569, Germany, I. BOZOVIC, Brookhaven National Laboratory, NY 11973, USA — X-ray absorption in $\text{Sr}_2\text{CuO}_{4-\delta}$ – La_2CuO_4 (SCO-LCO) superlattices shows a variable occupation with doping of two hole states. In addition to the holes doped for $x < x_{optimal}$ in bulk $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$, a variation with doping of a second hole state is observed at higher energy. Measurements suggest that this hole is located on apical oxygen atoms and polarized in the $a - b$ plane. Considering the surface reflectivity gives a good qualitative description of the line shapes of resonant soft X-ray scattering. The interference between the superlattice and surface reflections was used to distinguish between scatterers in the SCO and the LCO layers, with the two hole states maximized in different layers of the superlattice. This suggests that the states emptied preferentially in the SCO layers are the additional states in the extension of the Zhang-Rice singlet-upper Hubbard band model to higher doping levels.

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