

Abstract Submitted
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Doping dependence of the hole distribution in the high-temperature superconductor $\text{HgBa}_2\text{CuO}_{4+\delta}$ investigated by X-ray absorption spectroscopy¹ GUICHUAN YU, WOJCIECH TABIS, University of Minnesota, DENNIS NORDLUND, JUN-SIK LEE, SLAC National Accelerator Laboratory, TOMASZ KOLODZIEJ, AGH-University of Science and Technology, Poland, MICHAEL VEIT, CHELSEY DOROW, MUN CHAN, NEVEN BARIŠIĆ, MARTIN GREVEN, University of Minnesota — Using polarization dependent X-ray absorption spectroscopy at the O K and Cu L edges, the symmetry and distribution of the doping-induced states in the simple tetragonal model cuprate superconductor $\text{HgBa}_2\text{CuO}_{4+\delta}$ are studied as a function of the effective hole concentration p . We find that in the heavily underdoped regime, the doped holes predominantly reside in the planar O $2p_{x,y}$ orbitals, with an occupancy that extrapolates linearly to zero at $p_0 = 0$ and saturates at $p_2 \approx 0.1$. In contrast, holes in the apical O $2p_z$ orbitals only emerge near the boundary of the superconducting dome at $p_1 \approx 0.05$. Similar to the planar holes, these apical O holes also exhibit saturation behavior above p_2 . These observations suggest that the apical O holes might play an important role in the formation of superconductivity, and they imply the existence of an electronic instability as optimal doping is approached.

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