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Quasiparticle recombination dynamics in the model cuprate superconductor $HgBa_2CuO_{4+\delta}$[1] J.P. HINTON, E. THEWALT, J.D. KORALEK, J. ORENSTEIN, LBNL, UC Berkeley, N. BARISIC, University of Minnesota, CEA Saclay, X. XHAO, University of Minnesota, Jilin University, M. CHAN, C. DOROW, M. VEIT, L. JI, M. GREVEN, University of Minnesota — The cuprate family of high temperature superconductors is characterized by a variety of electronic phases which emerge when charge carriers are added to the antiferromagnetic parent compound. The structural simplicity of the single layer cuprate system $HgBa_2CuO_{4+\delta}$ (Hg1201) is advantageous for experimentally detecting subtle features of these phases. In this work, we investigate the recombination dynamics of photo-excited quasiparticles in Hg1201 as a function of doping, temperature, and magnetic field using pump-probe optical reflectivity. We observe two distinct onset temperatures above T_C in the underdoped part of the phase diagram, corresponding to T* and T** as observed in transport and neutron scattering experiments. We also measure a suppression of the recombination rate near TC which peaks at 8% hole concentration. We associate this suppression with coherence effects. Lastly, we observe a complex, non-monotonic temperature dependence in the dynamics around optimal doping, providing evidence for reentrant phase transitions near the apex of the superconducting dome.

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