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ARPES Investigation of Quasiparticle Renormalization in Cuprates

TANJA CUK, Stanford University

We investigated by Angle-Resolved-Photoemission-Spectroscopy the renormalization of the bands in Bi2212 as a function of doping, including underdoped (T_c =85K), optimally doped (T_c = 94K), and overdoped (T_c = 65K) samples. We identified the sharp energy scale seen in the superconducting state with the B_{1g} bond buckling mode, the out-of-phase vibrations of the in-plane oxygen. More recently, we compare doping dependent data to a theoretical calculation involving the identifiedmodes, including both temperature and momentum dependence. This comparison brings insights to the doping induced spectral changes in the overdoped regime, in connection to some recent discussions. We will also present complimentary pressure dependent Raman scattering and X-Ray diffraction data showing how the B_{1g} mode renormalizes with metallization of the insulating parent compound of Bi2212. The pressure variable allows a continuous assessment of the electron-phonon coupling lambda, based on both phonon frequency and lineshape, across the phase diagram. Finally, we discuss ways to test whether these mode couplings have a direct bearing on superconductivity.