

Evidence for hidden fermions and unconventional pairing in high-temperature superconducting cuprates

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Exploiting cluster dynamical mean field theory results on the two dimensional Hubbard Model, we show that “hidden fermionic excitations” emerge from the strong electronic correlation. This is a salient ingredient characterizing cuprate superconductivity. Hidden fermionic excitations are already present above the superconducting critical temperature T_c , where they originates the pseudogap, and smoothly evolve under T_c , giving rise to unconventional pairing mechanism. In particular, we find that the pairing involves electronic states situated at energies higher than the superconducting gap energy (and of the order of the pseudogap energy scale). These phenomena have direct fingerprint in the Raman B_{1g} response, which displays a characteristic peak-dip feature, which shows a peculiar behavior across T_c , in good agreement with our theory. These results reveal an unprecedented relationship between the pseudogap and superconducting gap, which are at the same time friend and foes.