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Quasiparticle Interference and Vortex Lattice Imaging in Pnictide Superconductors

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Abstract:

Quasiparticle interference and vortex imaging have both been shown to be powerful tools to investigate pnictide superconductors. Here I will review new results in the recently discovered family of 1144 materials, particularly in pure and Ni-doped $CaKFe_4As_4$ and in P-substituted Ba122. The 1144 $CaKFe_4As_4$ compound shows the highest Tc among stoichiometric pnictide superconductors (35 K). We show that this material is two-gap, sign-changing superconductor [1,2] and is located at optimal doping. Quasiparticle interference shows the opening of a superconducting gap in the hole bands around the zone center. Ni doping reduces Tc and induces a magnetic transition where a unique hedgehog magnetic order has been proposed [3]. I will discuss the changes in the superconducting gap, band structure and vortex lattice induced by Ni doping. Finally, I will mention efforts in the P-substituted Ba122 compounds [4], where we observe vortex lattices and determine the surface termination. This is the only material where we observe ultra-slow vortex creep, pointing out that there are dynamic properties specific to Ba122 compounds.

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