PSEUDOGAP AND PAIRING DUE TO KINETIC ENERGY SAVING IN DOPED ANTIFERROMAGNETS

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9.7 cm

An effective Hamiltonian representing propagation and interaction of spin polarons forming in weakly doped antiferromgnets is derived. The systems becomes superconducting upon doping. Paring may be attributed to kinetic energy saving due to a particular type of motion of a spin bipolaron, which corresponds to creep of a line consisting of defects in the antiferromagnetic spin background which connects two holes. That line moves by shrinking and expanding at opposite ends. The kinetic energy term in the Hamiltonian is affective at all stages of this process, and the term related to the magnetic exchange does not have to intervene, not like in the case of a single propagating hole, which lowers the kinetic contribution to the energy. The effective attraction is strongest in the undoped system where the antiferromagnetic order is most robust, but the superconducting order parameter vanishes when the doping parameter decreases which should be attributed to emptying the spin polaron band and approaching the Mott insulator phase. Since the normal phase representing a gas of single spin polarons is unstable toward formation of bound hole pairs a pseudogap forms in the excitation spectrum.

13.4 cm

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