"COMB-LIKE" POLARONS AND BIPOLARONS IN ANTIFERROMAGNETIC MATERIALS

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9.7 cm

The concept of a magnetic bipolaron as a possible candidate for Cooper-like pair in HT$_c$-compounds is well known. Usually antiferromagnetic bipolarons were considered on the basis of a classical model of the antiferromagnet (for example Mott-like bipolarons). In contrast in the present study we indicate a possibility of a new type of antiferromagnetic bipolaron formation, in the quantum antiferromagnet (QAF) approach.
We examine a Hamiltonian which is a sum of *d*-*d* interaction between localized *d*-spins in a finite 1D or 2D antiferromagnetic system and the *sp*-*d* interaction of QAF with a *sp* carrier. Varying the shape of spatial distribution of carrier we diagonalize the Hamiltonian strictly using the Lanczos method. The results show that the "comb-like" distribution of carrier density on every second spin of QAF is energetically the most favorable. In contrast to the Mott-like polaron which induces a local moment in the QAF system our new "comb-like" polaron orginates from damping of antiferromagnetic quantum fluctuations only. The most important feature of these polarons is a tendency to form pairs (bipolarons) glued by indirect exchange via QAF. We also present a possible scenario of the antiferromagnet - superconductor transition.

13.4 cm

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