EFFECTS OF DISORDER ON THE PROPERTIES OF A SYSTEM OF COEXISTING ITINERANT ELECTRONS AND LOCAL PAIRS

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9.7 cm

We study the influence of diagonal disorder (random site energy E_i) on the phase diagrams and thermodynamic properties of a system of coexisting itinerant electrons and local pairs, described by the (hard-core) boson-fermion model. Depending on the strength of random on-site energies, the intersite density-density repulsion of the local pairs and the particle concentrations one can develop several various phases in the model, including homogeneous phases: superconducting (SC), charge density wave (CDW) and the Bose-glass (NO), as well as the phase separated states (CDW-SC, CDW- NO). Also, in a definite range of parameters the system can exhibit the phenomena which we call a disorder induced superconductivity and a disorder induced charge ordering. One finds that the detailed features of the phase diagrams are rather sensitive to the choice of the distribution function of random potential. For rectangular distribution the SC transition is of second order for any local pair concentration n_d and any strength of disorder E_o. On the contrary for two-delta distribution the superconducting transition can be either second or first order depending on n_d and E_o. Moreover there is, for any n_d, a critical amount of disorder below which the SC order can be stable. The critical disorder is the largest close to half-filling of the local pair band ($n_d = 1$) and it is strongly diminished with increasing $|n_d - 1|$.

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