SUPERFLUID CHARACTERISTICS OF THE TWO-DIMENSIONAL PENSON-KOLB MODEL

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We study superconducting properties of the two-dimensional ($d = 2$) Penson-Kolb model, i.e. the tight-binding model with the pair-hopping (intersite charge exchange) interaction J, and analyze the effects of phase fluctuations on the s-wave superconductivity in this system. The evolution of the critical fields, the coherence length, the Ginzburg ratio and the London penetration depth λ_L with particle concentration n and pairing strength is determined. Within the Kosterlitz-Thouless scenario the critical temperatures T_c are calculated and compared with the ones from BCS-HFA T_{HFA}. The results show the enhancement of the gap to critical temperature ratio due to the phase fluctuations as well as a separation of the energy scales for the pair formation ($\sim k_B T_{HFA}$) and the phase coherence ($\sim k_B T_C$). The Uemura type plots, i.e. the $T_c \, vs \, \lambda_L^{-2}(0)$, are obtained both as a function of n and as a function of pairing strength and they are compared with those found earlier for the $d = 2$ attractive Hubbard model and the $d = 2$ extended Hubbard model with intersite attraction.

9.7 cm

13.4 cm

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