

Global Phase Diagram of the Spinless Falicov-Kimball Model in $d = 3$: Renormalization-Group Theory

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The global phase diagram of spinless Falicov-Kimball model in $d = 3$ spatial dimensions has been obtained by renormalization-group theory. This global phase diagram exhibits five distinct phases. Four of these phases are τ phases, in which the electron hopping strength diverges under repeated renormalizations. In the other (δ) phase, the hopping strength vanishes under repeated renormalizations. The phase boundaries are second order, except for an intermediate temperature regime, where a first-order phase boundary between two τ phases occurs. The cross-sections of the global phase diagram with respect to the chemical potentials of the localized and mobile electrons, at various fixed temperatures and hopping strengths, exhibit five distinct topologies.