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Static and dynamic properties of the spinless Falicov-Kimball model

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The spinless Falicov-Kimball model in one dimension is studied by use of a recently developed projector-based renormalization method (PRM) for many-particle Hamiltonians. The method is used to analyze static and dynamic low-temperature properties of the model at half-filling. To these belong the quasiparticle excitation energy $\tilde{\epsilon}_{\mathbf{k}}$ and the momentum distribution $n_{\mathbf{k}}$ of the conduction electrons and the spatial correlation function of the localized electrons. One of the remarkable results is the appearance of a gap in $\tilde{\epsilon}_{\mathbf{k}}$ at the Fermi level of order U which is accompanied by a smooth behavior of $n_{\mathbf{k}}$. The density of states of the conduction electrons and the one-particle spectral functions of the localized electrons are also discussed. In both quantities a gap opens with increasing U .

Keywords : Strongly correlated electrons, renormalization approach