Robust s± superconductivity in a two-band Hubbard-Fröhlich model of metallic electron-doped organics

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In spite of the damaging effect of strong electron-electron interaction on the conventional electron-phonon superconductivity, an increasing number of compounds such as fullerides exhibits superconductivity despite very narrow bands and strong electron repulsion. Motivated by the recent experimental reports about superconductivity in metallic electron–doped polycyclic aromatic hydrocarbons such as picene, coronene, phenanthrene and others, we carried out *ab* initio calculation for La-doped phenanthrene, and proposed a two-band Hubbard-Fröhlich model. The model embeds the ingredients of narrow bands, strong intermolecular Fröhlich type electron-phonon coupling and strong electron correlation. We firstly showed the mean field solution was a two-band s± superconducting state which survived due to gap parameters of opposite signs even in the presence of the large Hubbard U. We then introduced the correlation effects at the Gutzwiller level, and showed that the superconductivity state can still be stabilized at least for a moderately large U before the system ran into the antiferromagnetic state.

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