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Competition between spin-singlet and -triplet superconducting states in the doped extended Kitaev-Heisenberg model

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Abstract

Recently, the extended Kitaev-Heisenberg model has been proposed to describe spin-orbital Mott insulators, such as iridate oxides and ruthenium chloride with honeycomb lattice. Using mean-field theory, we obtain the linear gap equations to find all possible superconducting phases in terms of different exchanges and doping levels. Our calculation based on the hole-doped model, in the presence of the off-diagonal exchange Γ, shows the spin-triplet states can be stable in a larger area related to the doped Kitaev-Heisenberg model with $K<0$ and $J_H>0$. However, the finite ferromagnetic off-diagonal exchange solely cannot generate the triplet pairing instabilities in competition with the antiferromagnetic-Heisenberg and -Kitaev exchanges.

Keywords: spin-orbit Mott insulator, unconventional superconductivity, extended kitaev-heisenberg model

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