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Correlated properties of the doped Hubbard model on a honeycomb lattice TIANXING MA, LUFENG ZHANG, Beijing Normal University, HAI-QING LIN, Beijing Computational Science Research Center — Low doped graphene has a finite density of state, while heavily doped graphene have a Van Hove sigularity in the density of states, in combination with pronounced antiferromagnetic spin fluctuations close to half filling, and strong ferromagnetic correlation as doping is bellow the location of Van Hove singularity, which may lead to different unconventional superconductivity. We performed a systematic quantum Monte Carlo study of the pairing correlation in the Hubbard model on a honeycomb lattice. Close to half filling, we find that pairing with d+id symmetry dominates over pairing with extended-s symmetry. When the next-nearest-neighbor t' is larger than t/6, the single-particle spectrum is featured by the continuously distributed Van Hove saddle points at the band bottom, where the density of states diverges in a power law. We investigate possible unconventional superconductivity in such systems with the Fermi level close to the band bottom by employing both random-phase-approximation and determinant quantum Monte Carlo approaches. Our study reveals a possible triplet p+ip superconductivity with appropriate interactions in low-filled graphene. We also explore the effect of the disorder and spin-orbit coupling on the magnetic correlation in doped graphene.

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