RKKY COUPLING BETWEEN MAGNETIC IMPURITIES IN GRAPHENE NANOFLAKES

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9.7 cm

Graphene nanostructures offer a promising route to graphene-based spintronics and their magnetic properties attract increasing attention, exhibiting highly nontrivial physics [1]. One of the scenarios leading to the emergence of magnetism is doping of graphene with magnetic impurity atoms. The subject of our study is the Ruderman-Kittel-Kasuya-Yosida (RKKY) interaction between two magnetic impurities located in the single-layer graphene nanoflakes, mediated by the charge carriers present in the nanostructure. The study is not limited to the case of half-filling (corresponding to the equilibrium electron concentration in graphene). The paper also considers the possibility of varying the charge concentration "electron by electron" in the structures. One of the goals is to search for the configuration for which the coupling changes its character between ferro- and antiferromagnetic as a result of adding or removing a single electron from the system, in close vicinity of half-filling conditions, which would allow to control the interaction. The tight-binding approximation, exact diagonalization, and non-perturbative approach is used to describe the electronic properties. The importance of Coulomb interaction-driven correlations for RKKY interaction in graphene nanostructures is revealed by applying the Hubbard model.

[1] O. V. Yazyev, Rep. Prog. Phys. **73**, 056501 (2010).

13.4 cm

Subject category :

5. Nano-structure, Surfaces, and Interfaces

Presentation mode :
poster

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