RKKY interaction in graphene

Eugene Kogan

Department of Physics, Bar-Ilan University, Ramat-Gan 52900, Israel
Eugene.Kogan@biu.ac.il

Abstract

Ruderman-Kittel-Kasuya-Yosida (RKKY) interaction between two magnetic impurities in graphene was theoretically studied quite intensely during last several years [1–9]. One may ask, why the problem, which is in principle so simple (in the lowest order of perturbation theory, as it was treated in all the papers referenced above, the problem is equivalent to calculation of a single bubble diagram), was the subject of so many publication, using different approaches? One of the answers to this question is connected with the fact that a simply written integral is not necessarily a simply calculated integral, and formally identical formulas can give different results. So much so, that in some of the referenced papers one has to deal with divergent integrals, while in the others, only convergent integrals appear. We'll present a review of existing approaches to the calculation of RKKY interaction in graphene and of the obtained results. We'll also briefly mention RKKY interaction in bilayer graphene and in molybdenum disulfide.

References

[1] V. K. Dugaev, V. I. Litvinov and J. Barnas, Phys. Rev. B **74**, 224438 (2006).

[2] L. Brey, H. A. Fertig and S. D. Sarma, Phys. Rev. Lett. **99**, 116802 (2007).

[3] S. Saremi, Phys. Rev. B **76**, 184430 (2007).

[4] A. M. Black--Schaffer, Phys. Rev. B **81**, 205416 (2010).

[5] B M. Sherafati and S. Satpathy, Phys. Rev. B **83**, 165425 (2011).

[6] B. Uchoa, T. G. Rappoport, and A. H. Castro Neto, Phys. Rev. Lett. **106**, 016801 (2011).

[7] J. E. Bunder and H.-H. Lin, Phys. Rev. B **80**, 153414 (2009).

[8] E. Kogan, Phys. Rev. B **84**, 115119 (2011).

[9] E. Kogan, Graphene **2**, N 1, 8 (2013).