

Localized states at the Rashba spin-orbit domain wall in a magnetized graphene: interplay of the Rashba and magnetic domain walls

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It is well known that electronic states in a graphene with uniform Rashba spin-orbit interaction and also uniformly magnetized due to exchange coupling to a magnetic substrate display an energy gap in the Dirac K and K' points. When the magnetization of graphene is nonuniform and forms a magnetic domain wall, electronic states localized at the wall exist in the energy gap. In this paper we show that similar localized electronic states appear in the gap in the case of a uniformly magnetized graphene, but with the domain wall in the Rashba spin-orbit interaction (i.e. opposite signs of the Rashba parameter on both sides of the wall). These electronic states propagate along the wall and are localized exponentially at the Rashba domain wall. They form narrow and nearly parabolic bands, with relatively large effective electron mass. However, contrary to the magnetic domain wall, these states do not close the energy gap. We also consider the situation when the magnetic domain wall is associated with the Rashba one and both are localized at the same position.

References:

[1] M. Inglot, V. K. Dugaev, A. Dyrdał, and J. Barnaś, Graphene with Rashba spin-orbit interaction and coupling to a magnetic layer: Electron states localized at the domain wall, *Phys. Rev. B* 104, 214408

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