Pseudo-gap opening and Dirac point confined states in doped graphene[1]

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Abstract

The appearance of a pseudo-gap and the buildup of states around the Dirac point for doped graphene can be elucidated by an analysis of the density of states spectral moments. Such moments are calculated by using the Cyrot-Lackmann theorem[2], which highlights the importance of the network local topology. Using this approach, we sum over all disorder realizations up to a certain radius to show how the spectral moments change. As a result, the spectrum becomes unimodal, however, strictly localized states appears at the Dirac point. Such states are important for the magnetic properties of graphene, and are calculated as a function of the doping concentration. By removing these states in the count of the spectral moments, it is finally seen that the density of states increases its bimodal character and the tendency for a pseudo-gap opening. This result is important to understand the trends in the magnetic and electronic properties of doped graphene. In graphene with vacancies, the same ideas can also be useful to isolate in a rough way which effects are due solely to topology.

References

[1] J.E. Barrios-Vargas, Gerardo G. Naumis, Solid State Communications, **162** (2013) pp. 23-27.

[2] F. Cyrot-Lackmann, J. Phys. Chem. Solids, **29** (7) (1968), pp. 1235-1243.