Dynamical conductivity of doped graphene and doped Dirac semimetals

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Abstract

The memory-function conductivity formula from Ref. [1] is applied to doped graphene and doped Dirac semimetals. The Fermi energy is assumed to have the same value in both systems. The conduction electrons in Dirac semimetals are described by the 3D Dirac Hamiltonian from Ref. [2] with a finite value of the Dirac electron mass *m*. It is shown that in both cases the scattering of conduction electron by acoustic/optical phonons leads to the redistribution of the intraband conductivity spectral weight over a wide frequency range. This effect is found to be particularly important in Dirac semimetals when the interband gap associated with a finite *m* is comparable to typical phonon energies. The results are compared with experimental data for the Dirac semimetal Cd_2As_3 from Ref. [3]

References

[1] I. Kupčić, Phys. Rev. B 95 (2017) 035403
[2] H. Zhang et al., Nat Phys. 5 (2009) 438
[3] I. Crassee et al., Phys. Rev. 97 (2018) 125204