Chemical sensing with graphene: A quantum field theory perspective

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Abstract

We studied theoretically the effect of a low concentration of adsorbed polar molecules on the optical conductivity of graphene, within the Kubo linear response approximation[1]. Our analysis is based on a continuum model that includes up to next-to-nearest neighbors in the pristine graphene effective Hamiltonian[2,3]. Our results show that the conductivity can be expressed in terms of renormalized quasiparticle parameters that include the effect of the molecular surface concentration and dipolar moment, thus providing a quantum field theory approach to model a graphene-based chemical sensor[1].

REFERENCES

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[2] H. Falomir, M. Loewe, E. Muñoz, and A. Raya, Physical Review B 98, 195430 (2018).
[3] H. Falomir, E. Muñoz, M. Loewe, and R. Zamora, Journal of Physics A: Mathematical and Theoretical 53, 015401 (2020).

FIGURES

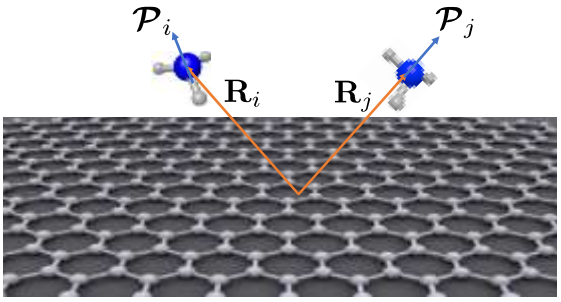

Figure 1: Pictorial (not in actual scale) representation of polar molecules adsorbed at positions **R***i* and **R***j* on the surface of graphene[1].

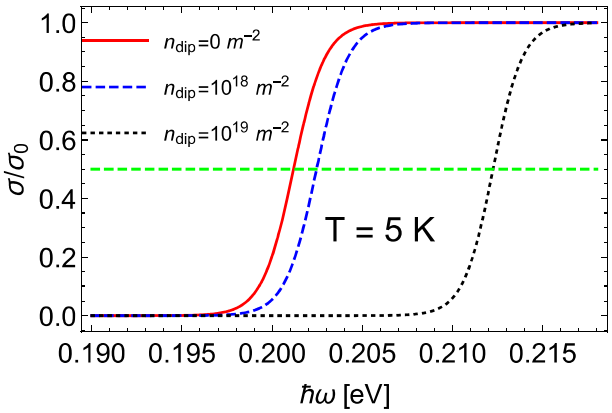

Figure 2: Optical conductivity of graphene, calculated from our theory[1], at different surface concentrations of adsorbed polar molecules.