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


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.