

Electron-phonon coupling in low dimensional graphene-based systems: theory and numerical simulation

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The design of new opto-electronic devices requires understanding of the properties of valence electrons. In nano-objects, these properties are unique due to the **electronic confinement in low dimensional systems**. They can be studied by the simulation of electronic excitations via the dielectric function. The approaches we develop and use are **ab-initio theories and calculations**, which means without adjustable parameter, making them extremely reliable and flexible. They are based on the use of the Bethe-Salpeter equation, which takes into account the electron-hole interaction.

Graphene and carbon nanotubes exhibit exceptional electronic properties, due to the linearly dispersing bands at the Fermi level (Dirac electrons). For this reason, such materials exhibit very low energy excitations, for which the question of the influence of phonons arises.

The formalism used and developed in our ab initio calculations is based on the electron-boson coupling, where the boson is the electron-hole pair. In this thesis, we propose to generalize the formalism to electron-phonon coupling, where the boson describes the phonon.

NB : the candidate must contact the lab before 15th of march.

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