Inelastic vibrational signals in electron transport across graphene nanoconstrictions

We present calculations of the inelastic vibrational signals in the electrical current through a graphene nanoconstriction. We find that the inelastic signals are only present when the Fermi-level position is tuned to electron transmission resonances, thus, providing a fingerprint which can link an electron transmission resonance to originate from the nanoconstriction. The calculations are based on a novel first-principles method which includes the phonon broadening due to coupling with phonons in the electrodes. We find that the signals are modified due to the strong coupling to the electrodes, however, still remain as robust fingerprints of the vibrations in the nanoconstriction. We investigate the effect of including the full self-consistent potential drop due to finite bias and gate doping on the calculations and find this to be of minor importance.

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