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Raman Spectroscopy as an Accurate Probe of Defects in Graphene[1] JOAQUIN RODRIGUEZ-NIEVA, MIT, USA, EDUARDO BARROS, Universidade Federal do Ceara, Brazil, RIICHIRO SAITO, Tohoku University, Japan, MILDRED DRESSELHAUS, MIT, USA — Raman Spectroscopy has proved to be an invaluable non-destructive technique that allows us to obtain intrinsic information about graphene. Furthermore, defect-induced Raman features, namely the D and D' bands, have previously been used to assess the purity of graphitic samples. However, quantitative studies of the signatures of the different types of defects on the Raman spectra is still an open problem. Experimental results [1] already suggest that the Raman intensity ratio $I_D/I_{D'}$ may allow us to identify the nature of the defects. We study from a theoretical point of view the power and limitations of Raman spectroscopy in the study of defects in graphene. We derive an analytic model that describes the Double Resonance Raman process of disordered graphene samples, and which explicitly shows the role played by both the defect-dependent parameters as well as the experimentally-controlled variables. We compare our model with previous Raman experiments, and use it to guide new ways in which defects in graphene can be accurately probed with Raman spectroscopy.
[1] A. Eckmann, *et al.*, Nano Lett 12,3925 (2012)

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