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Tuning the Kohn Anomaly in the Phonon Dispersion of Graphene by Interaction with the Substrate and by Doping LUDGER WIRTZ, CNRS - IEMN, Lille, France, ADRIEN ALLARD, CNRS - IEMN, Lille, CLAUDIO ATTACCALITE, CNRS, Institut Neel, Grenoble, MICHELE LAZZERI, CNRS - IMPMC, Paris, FRANCESCO MAURI, ANGEL RUBIO, ETSF/Univ. Basque Country, San Sebastian, Spain — The phonon dispersion of graphene displays two strong Kohn Anomalies (kinks) in the highest optical branch (HOB) at the high-symmetry points G and K. The slope of the HOB around K is a measure of the electron-phonon coupling (EPC) and determines the dispersion of the Raman D and 2D lines as a function of the laser energy. We show that the EPC can be strongly modified both due to interaction with a metallic substrate and due to doping. For graphene grown on a Ni(111) surface, a total suppression of the Kohn anomaly occurs: the HOB around K becomes completely flat. This is due to the strong hybridization of the graphene p-bands with the Nickel d-bands which lifts the linear crossing of the p-bands at K. From experimental phonon dispersions one can therefore draw conclusions about the interaction strength between graphene and its different substrates. Furthermore, we present a new way to tune the EPC in graphene through electron/hole doping. We show that for the highest optical branch at K, the EPC is strongly dependent on the doping level. This dependency influences the dispersion of the Raman D and 2D lines and makes it possible to measure the charge state of graphene via resonant Raman spectroscopy.

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