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Optical phonons behavior in doped bilayer graphene LEANDRO MALARD, D. L. MAFRA, J. LEON, T. CAMPOLINA, D. C. ELIAS, F. PLENTZ, E. S. ALVES, M. A. PIMENTA, Universidade Federal de Minas Gerais — The interaction of electrons and phonons is a fundamental issue for understanding the physics of graphene, resulting in the renormalization of phonon energy as a function of Fermi energy, which has been ascribed to the breakdown of the adiabatic approximation. In this work we study the behavior of the optical phonon modes in different bilayer graphene devices by applying bottom or top gate voltage, using Raman scattering. We observe the splitting of the Raman G band as we tune the Fermi level of the samples, which is explained in terms of distinct electron-phonon couplings involving the Raman (Eg) and infrared (Eu) phonon modes, the later one being Raman activated by inversion symmetry breaking in bilayer graphene due to different doping between the top and bottom layers [1]. We compare our data with recent theoretical calculations of the bilayer graphene phonon self-energy which includes non-homogeneous charge carrier doping between the graphene layers [2,3]. The comparison between the experiment and theoretical predictions can give information about the surrounding environment of the bilayer graphene. [1] L. M. Malard et al., Phys. Rev. Lett. **101**, 257401 (2008). [2] T. Ando and M. Koshino, J. Phys. Soc. Jpn. **78**, 034709 (2009). [3] P. Gava, M. Lazzeri, A. Marco Saitta, and F. Mauri, Phys. Rev. B **80**, 155422 (2009).

Leandro Malard
Universidade Federal de Minas Gerais

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