Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Using the G' Raman cross-section to understand the phonon dynamics in bilayer graphene systems DANIELA MAFRA, Universidade Federal de Minas Gerais, PAULO ARAUJO, Massachusetts Institute of Technology, KENTARO SATO, RIICHIRO SAITO, Tohoku University, MILDRED DRESSELHAUS, JING KONG, Massachusetts Institute of Technology — The integrated area (IA) of the four peaks (P_{11}, P_{12}, P_{21} and P_{22}) of the G′ Raman band of AB stacked bilayer graphene are analyzed as a function of the laser power for different laser lines. We show that the IA of each peak depends on temperature and also depends on the laser excitation energy. This special dependence is explained in terms of the electron-phonon coupling and the relaxation time of the photon-excited electron. Due to the short relaxation time of the photo-excited electron by emitting phonons, the relative intensities of the four peaks are determined by a different combination of relaxation processes that give rise to some G′ peaks increasing in IA at the expense of others, thereby making the IA of the peaks different from each other and dependent on laser excitation energy and power level. Also, we report an anomalous behavior of the G′ IA for the 532 nm laser energy, that shows a resonance regime in which a saturation of what we call the P_{12} process occurs. This effect is a relevant phenomenon that gives important information about the electron and phonon dynamics and needs to be taken into account for certain applications of bilayer graphene in the field of nanotechnology.

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Date submitted: 08 Nov 2011 Electronic form version 1.4