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Influence of dopants on carrier dynamics and low-frequency phonon modes in bilayer graphene RAMAKRISHNA PODILA, Department of Physics and Astronomy and Clemson Nanomaterials Center (CNC), Clemson University, Clemson, SC USA, BENOY ANAND, Sri Sathya Sai Institute of Higher Learning, Puttaparthi, India, AJAY SOOD, IISc, Bangalore, India, REJI PHILIP, Raman Research Institute, Bangalore, India, APPARAO RAO, Department of Physics and Astronomy and Clemson Nanomaterials Center (CNC), Clemson University, Clemson, SC USA — Controlling the electronic structure of graphene with substitutional doping is central to many fascinating applications. For example, graphene's unique band structure coupled with its nonlinear optical properties (NLO) allows it to serve as a saturable absorber in an all-carbon optical diode . Although dopant effects are often correlated to the dopant concentration in the graphene lattice, the role of dopant's local bonding environment has not been explored in sufficient detail (R. Podila et al., Appl. Phys. Lett., 101, 123108 (2012)). Here, we present the effect of substitutional nitrogen (N) doping on the saturable absorption characteristics and carrier dynamics of chemical vapor deposited bi-layer graphene. We find that the saturation depth and carrier relaxation times are greatly influenced by the dopant density, and the N bonding configurations. The latter is inferred from the low-frequency phonon modes which are derived from the Fourier transform pump-probe spectra of N-doped bilayer graphene. Understanding the role of dopants on the NLO properties of graphene offers the possibility of tailoring graphene for opto-electronic applications *via* defect engineering.

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