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Optical pump-THz probe measurements of self-assembled h-BN/G heterostructures BALA MURALI KRISHNA M, CATHERINE C, T. HARADA, Femtosecond Spectroscopy Unit, Okinawa Inst Sci & Technol, Okinawa, Japan, SOUMYA V, J. TAHA-TIJERRINA, P. NGUYEN, P. CHANG, P.M. AJAYAN, Rice Univ, Dept Mech Engn & Mat Sci, Houston, TX, USA, N.T. NARAYANAN, CSIR-CECRI, Karaikudi, India, K.M. DANI, Femtosecond Spectroscopy Unit, Okinawa Inst Sci & Technol, Okinawa, Japan — Two dimensional materials have attracted significant interest in recent times due to properties like large electron mobility, extreme thermal conductivity and high young's modulus. The potential of combining different two-dimensional materials to form new heterostructures with new functionality offers intriguing possibilities. Here, we study the opto-electronic properties of new types of solids consisting of randomly stacked layers of hexagonal boron nitride (h-BN) and graphene (G). We prepare these artificially stacked h-BN/G solids with different ratios of h-BN and G by mixing dispersions of exfoliated h-BN layers and graphene in different concentrations and allowing the exfoliated flakes to form the h-BN/G solids via van der Waals interaction. We study the ultrafast photocarrier dynamics in these solids by pumping with femtosecond visible-near-infrared pulses of light, and probing the transient photoconductivity with sub-picosecond Terahertz pulses. As we tune the ratio of h-BN and G in the new h-BN/G solids, we not only observe opto-electronic properties that tune from the insulating h-BN phase to semi-metallic G phase, but we also see unique behavior, distinct from either phase, for certain h-BN/G ratios in between the two extreme phases.

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