Light Emission from Graphene Induced by Femtosecond Laser Pulses

CHUN HUNG LUI, KIN FAI MAK, JIE SHAN, TONY HEINZ — Since graphene has no band gap, light emission is not expected from relaxed carriers. On the other hand, the strong optical absorption in graphene over a wide spectral range suggests the possibility of hot luminescence from non-equilibrium carriers. Here we report the observation of light emission from monolayer graphene induced by excitation with ultrashort (30-fs) laser pulses. We observe emission throughout the visible spectrum, extending to a photon energy of 3.5 eV in the near UV. In contrast to conventional hot luminescence processes, however, we find strong light emission at photon energies exceeding that of the pump laser at 1.5 eV. In addition to detailed measurements of the emission spectra and their dependence on pump fluence, we have performed ultrafast time-domain correlation technique in which light emission is measured as a function of the temporal separation between a pair of femtosecond excitation pulses. A dominant relaxation time of a few 10's of fs is observed. The origin of this unusual light emission process and its relation to the underlying carrier dynamics in graphene will be discussed.

Kin Fai Mak

Date submitted: 20 Nov 2009

Electronic form version 1.4