Tuning of Dirac point in hBN/SLG heterostructure

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Abstract
Previous studies report photoinduced doping in single layer graphene (SLG)/hexagonal boron nitride(h-BN) due to optical excitation of the defects in h-BN and charge transfer between h-BN and SLG [1][2]. In our studies, we used optoelectrical transport measurement technique to study the phenomena that cause the Dirac point to shift. We observed a dependence on wavelength. The h-BN/SLG heterostructure shows potential for memory devices and a single photon detector due to its reproducible writing and erasing; and sensitivity to light. The advantage of such a device is its simple structure and that it can be tuned at room temperature. We also use this optical technique to tune the Dirac point in the h-BN/SLG/h-BN Moire system to overcome the barrier of gate leakage.

References

[1] Ju, L., Velasco, J., Huang, E. *et al. Nature Nanotech* **9,** 348–352 (2014)
[2] Nicholas L. McDougall, Jim G. Partridge, Rebecca J. Nicholls, Salvy P. Russo, and Dougal G. McCulloch Phys. Rev. B **96**, 144106 (2017)

Figures

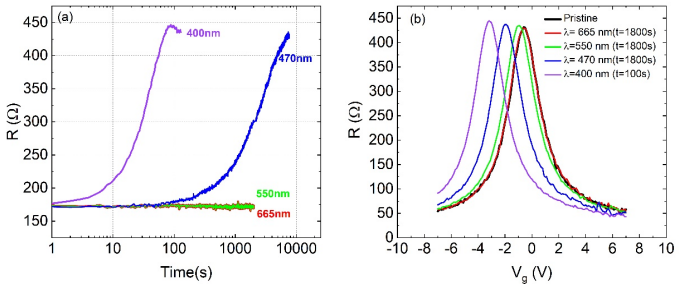

Figure 1: *(a)Resistance vs time graph for red, green, blue, and violet light at V_g=-4V (Time is plotted in log scale). (b) Shift seen in R-V_g response after exposure to light.*

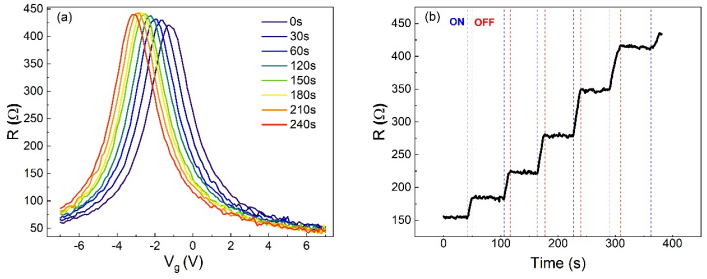

Figure 2: *(a)Pinning of Dirac point at different values of gate voltage by changing the exposure time to light. (b)Sensitivity to light; resistance value starts to increase as soon as the light is switched on and saturates at the value when the light is switched off.*