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Photocurrent generation of graphene p-n junction formed by interface modification

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In the last JSAP fall meeting (18a-B1-2), we demonstrated a method to optimize the performance of CVD-grown graphene FET device by functionalizing the surface of SiO_2 substrates with silane self-assembled monolayers (SAMs). Butyltriethoxysilane and 3-aminopropyltriethoxysilane were used to achieve air-stable p- and n-doped graphene in wafer scale, respectively.[1] Moreover, graphene p–n junction arrays were also created by patterning silane modifiers on SiO_2 wafer by micro-fabrication process. Here, we discuss the transport performance and photocurrent generation of graphene p-n junction formed by the interface modification method. As shown in Figure 1(a), optical microscopy and Raman spectroscopy were applied to identify the junction in the graphene device. The CVD graphene on patterned SAMs film exhibited two separate Dirac points in FET transfer curves, indicating an energy separation of neutrality points over junction. And an efficient photocurrent generation was detected by laser excitation at the junction under ambient conditions (Figure 1(b)). The photo-electric conversion could be realized by a hot-carrier-assisted photothermoelectric effect.[2]

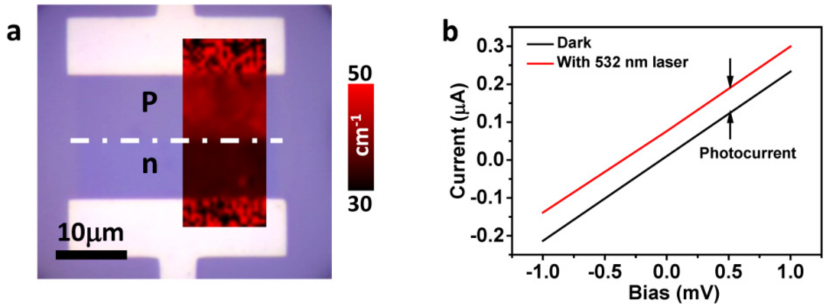

Figure 1(a) Optical image and Raman 2D band-width-map of graphene p-n junction. (b) Current versus source–drain bias in the dark and under the illumination of laser beam (spot size: ~1μm) focused at the graphene p-n junction

References:

[1] S. Wang *et al.*, *Appl. Phys. Lett.* **2013**, 103, 253116.

[2] K. Yan *et al.*, *Nat. Commun.* **2012**, 3, 1280.