Fermi level dependent saturable absorption of graphene

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Graphene has attracted plenty of attentions due to its amazing electric and optical properties. Owing to the unique electronic structure of Dirac cone and massless fermions, the strong optical nonlinearity has been realized and demonstrated with dependency of Fermi level [1]. In this work, Fermi-level tunable p-type graphene was prepared by controlling the relative humidity (RH). The Raman spectrum shows clear tendency of blueshift and the minimum conductance position of field effect transistor (FET) moves to higher applied voltage as increasing the RH. This is due to that electrons in graphene migrate to surface water molecules [2], leading to the downward movement of Fermi level to p-type further. Additionally, the Fermi-level dependent saturation absorption of p-type graphene was also investigated and discussed.

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[2] Probing Charge Transfer at Surfaces Using Graphene Transistors. By Pierre L. Levesque, Shadi S. Sabri, Carla M. Aguirre, Jonathan Guillemette, Mohamed Siaj, Patrick Desjardins, Thomas Szkopek, and Richard Martel. Nano Lett. 2011, 11, 132–137