NW-P037

Fabrication of Photo Sensitive Graphene Transistor Using Quantum Dot Coated Nano-Porous Graphene

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Graphene is an attractive material for various device applications due to great electrical properties and chemical properties. However, lack of band gap is significant hurdle of graphene for future electrical device applications. In the past few years, several methods have been attempted to open and tune a band gap of graphene. For example, researchers try to fabricate graphene nanoribbon (GNR) using various templates or unzip the carbon nanotubes itself. However, these methods generate small driving currents or transconductances because of the large amount of scattering source at edge of GNRs. At 2009, Bai et al. introduced graphene nanomesh (GNM) structures which can open the band gap of large area graphene at room temperature with high current. However, this method is complex and only small area is possible. For practical applications, it needs more simple and large scale process. Herein, we introduce a photosensitive graphene device fabrication using CdSe QD coated nano-porous graphene (NPG). In our experiment, NPG was fabricated by thin film anodic aluminum oxide (AAO) film as an etching mask. First of all, we transfer the AAO on the graphene. And then, we etch the graphene using O2 reactive ion etching (RIE). Finally, we fabricate graphene device thorough photolithography process. We can control the length of NPG neckwidth from AAO pore widening time and RIE etching time. And we can increase size of NPG as large as 2 cm^2. Thin CdSe QD layer was deposited by spin coatingprocess. We carried out NPG structure by using field emission scanning electron microscopy (FE-SEM). And device measurements were done by Keithley 4200 SCS with 532 nm laser beam (5 mW) irradiation

Keywords: Nano-porous graphene, Transistor, Quantum dot