NF-P007

# Effects of Residual PMMA on Graphene Field-Effect Transistor

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Graphene, two dimensional single layer of carbon atoms, has tremendous attention due to its superior property such as fast electron mobility, high thermal conductivity and optical transparency, and also found many applications such as field-effect transistors (FET), energy storage and conversion, optoelectronic device, electromechanical resonators and chemical sensors. Several techniques have been developed to form the graphene. Especially chemical vapor deposition (CVD) is a promising process for the large area graphene. For the electrically isolated devices, the graphene should be transfer to insulated substrate from Cu or Ni. However, transferred graphene has serious drawback due to remaining polymeric residue during transfer process which induces the poor device characteristics by impurity scattering and it interrupts the surface functionalization for the sensor application. In this study, we demonstrate the characteristics of solution-gated FET depending on the removal of polymeric residues. The solution-gated FET is operated by the modulation of the channel conductance by applying a gate potential from a reference electrode via the electrolyte, and it can be used as a chemical sensor. The removal process was achieved by several solvents during the transfer of CVD graphene from a copper foil to a substrate and additional annealing process with H2/Ar environments was carried out. We compare the properties of graphene by Raman spectroscopy, atomic force microscopy(AFM), and X-ray Photoelectron Spectroscopy (XPS) measurements. Effects of residual polymeric materials on the device performance of graphene FET will be discussed in detail.

**Keywords:** Graphene, Soultion-Gate FET