The Extraordinary Route of Chlorine Pre-Substitutional Doping on Graphene/Copper Substrate

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Abstract: By the pre-doping technique on graphene/copper foil, we obtained the pristine sheet resistance and optical transmittance of the chlorine doped-single layer graphene 245 Ω/sq and 97% at 550 nm wavelength, respectively. X-ray photoelectron spectroscopy revealed that an extremely high Cl coverage of 47.3% of monolayer graphene surface was achieved as the highest surface-coverage graphene doping material ever reported.

1. Introduction

Plasma doping is an effective technique for tuning the graphene properties. Zhang et al used microwave plasma accompanied DC biasing of the substrate for chlorine functionalization of graphene [1]. At an optimized condition (bias voltage of 8 V), they achieved 45.3% of chlorine coverage on graphene and they observed averaged sheet resistance was decreased from 678 to 342 Ω/sq. The chlorine plasma is the most controllable for graphene doping and can produce non-destructive doping with increased electrical conductance [2].

2. Discussion:

We investigated the relationship between sheet resistance and Cl coverage and the synergetic effect by combination of pre- and normal doping. By using low energy radical doping method, we controlled the doping concentration and sheet resistance. With pre-doping chlorine technique on CVD graphene/copper foil, chlorine residue on graphene after transferred on PET/Si/SiO_2 substrates due to PMMA residue was defined.

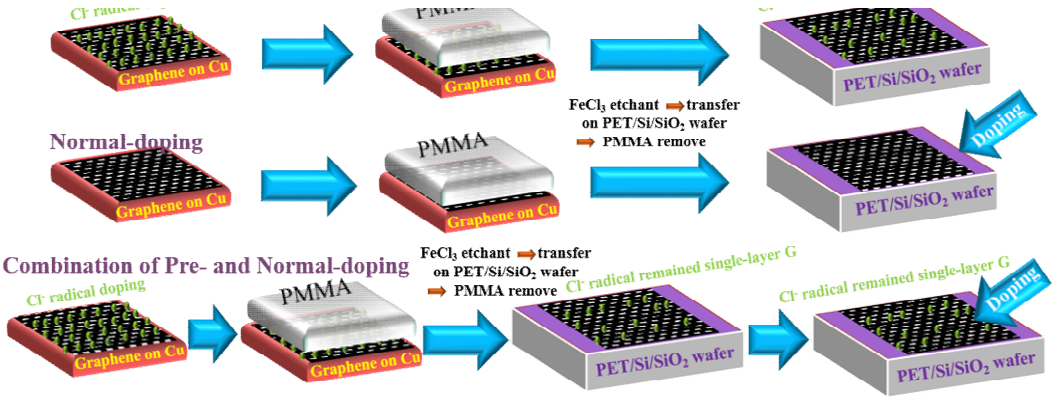

Figure 1. Schematic of the chlorine-doping processing

3. References

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