Realization of N-doping in Graphene via 4-Aminothiophenol Functionalization

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Abstract

Graphene, possess exceptional electrical and optical properties due to its unique sp^2 hybridized hexagonal structure and linear energy-momentum relationship near Dirac point. Very high room temperature mobility and highest specific surface area makes graphene very promising candidate for electronics and sensing applications. However, graphene gets easily p-doped when exposed to ambient conditions, restricting its applicability in practice. Herein, we have explored chemical functionalization of graphene using 4-Aminothiophenol (4–ATP) for realization of n-doping in graphene. It has been observed that non-covalent functionalization via 4–ATP dopes the GFETs n–type and shifts the Dirac point of GFETs in negative direction by -40 V to -50 V gate voltage. Further it enhances the electron mobility and symmetry of current-voltage characteristics. The X-ray photoelectron Spectroscopy (XPS) of 4-ATP-doped graphene (4ATP_Gr) shows occurrence of N1s peak confirming n-type doping of graphene. Moreover existence of S2s and S2p peaks elucidates thiol functionalization of graphene opening new route towards sensing application. Stability of such n-type doping (for >40 days), ensures its practical applicability towards development of graphene based electronics and sensing technology.

References

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Figures

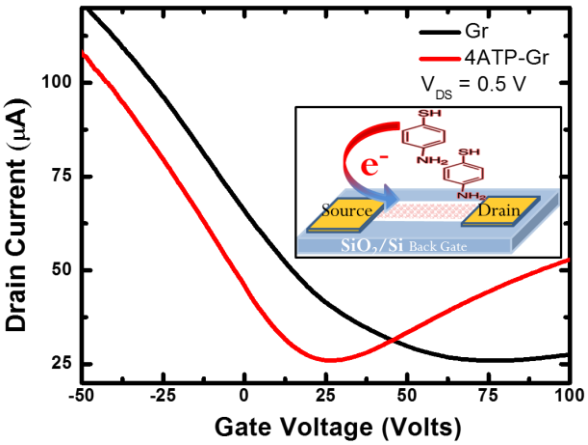

Figure 1: Gate voltage vs. Drain current characteristics of GFET (black) and 4ATP-doped GFET (red); Inset-Charge transfer interaction between 4-ATP and graphene