Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Substituent Effects for the Control of Covalent Electronic Doping of CVD Graphene GERALDINE L.C. PAULUS, Massachusetts Institute of Technology, MOON-HO HAM, Kyungwon University, QING HUA WANG, ANDREW J. HILMER, KI KANG KIM, CHIH-JEN SHIH, ZACHARY ULISSI, JING KONG, MICHAEL S. STRANO, Massachusetts Institute of Technology — Controlling the electrical properties of graphene is of particular interest for future electronic, optoelectronics and sensing applications. We investigate the doping effect of different chemical functional groups covalently attached to CVD-grown graphene devices with a polymer electrolyte top-gate. The covalent reaction is based on a diazonium chemistry, specifically the type and degree of doping for a diazonium salt with a nitro group, a bromo group or an alkyne group attached are investigated. We use three different approaches to inspect various aspect of the doping in graphene: Gaussian calculations, Raman measurements and transfer-characteristics. The transfer curves show that nitro groups induce p-doping while the bromo- and alkyne groups induce n-doping. A new model that takes into account both coulombic and resonant scattering as well as a asymmetric electron and hole transport is developed to fit the transfer-curves. The graphene transistors are very robust and reproducible, suggesting this is a simple and facile way to control the electronic properties of graphene.

Geraldine L.C. Paulus
Massachusetts Institute of Technology

Date submitted: 11 Nov 2011 Electronic form version 1.4