Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Modification of electrical transport properties of graphene field effect devices due to electron-mediated molecular adsorption SUNG OH WOO, Department of Physics and Astronomy, Texas A&M University, WINFRIED TEIZER, Department of Physics and Astronomy, Texas A&M University and WPI-Advanced Institute for Materials Research, Tohoku University, Sendai, Japan — We study graphene field effect transistor devices that have been exposed to electron beam irradiation. Upon irradiation in vacuum, the Dirac point shifted to negative gate voltage, and in-situ electrical transport measurements indicate the emergence of gate voltage hysteresis of the graphene devices. Both the Dirac point and the hysteresis revert towards their pre-irradiation status over the course of a few days when the graphene is maintained under vacuum. Once the irradiated devices are exposed to ambient air, the original Dirac point was recovered within two hours and the hysteresis disappeared. However, transport properties were not fully recovered but instead degraded depending on electron dosage. In addition, as a result of the irradiation the Raman 'D' band, which is an indication of defect generation, emerged and its intensity increased with increasing electron dosage. In addition, we investigated the adsorbate on graphene by atomic force microscopy. The state of the adsorbate on graphene was observed to change with electron dosage indicating that redox coupling is a likely cause of both the Raman defect signal as well as the scattering centers that deteriorate the transport properties.

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Date submitted: 13 Nov 2013 Electronic form version 1.4