

Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Electronic transport properties of graphene irradiated by charged particles¹ JIAN-HAO CHEN, WILLIAM CULLEN, CHAUN JANG, MICHAEL FUHRER, ELLEN WILLIAMS, Materials Research Science and Engineering Center, Center for Nanophysics and Advanced Materials, Dept of Physics, Univ. of Maryland, College Park, MD — We have measured the effect of low energy charged particle irradiation (electrons, He ions, Ne ions or Ar ions) on the electronic transport properties of clean graphene devices on SiO₂. Charged particle irradiation induces additional scattering which is consistent with adding both short-ranged (i.e. point defect) and long-ranged (i.e. charged) impurities to the device. We also performed temperature-dependent conductivity of the irradiated devices from 9K to 400K in ultra high vacuum. In sharp contrast to graphene with charged impurity disorder, which remains metallic at low temperature, even a small amount of irradiation-induced disorder (one order of magnitude increase in room-temperature resistivity compared to pristine devices) produces a divergence of the resistivity and insulating behavior at low temperature for carrier densities below $4 \times 10^{12} \text{cm}^{-2}$.

¹This work was supported by the University of Maryland MRSEC and the Nanoelectronics Research Initiative of the Semiconductor Research Corporation.

Jian-Hao Chen
Materials Research Science and Engineering Center, Center for Nanophysics
and Advanced Materials, Dept of Physics, Univ. of Maryland, College Park

Date submitted: 10 Dec 2008

Electronic form version 1.4