Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Intrinsic Dirac Point Energy Level and Band Offset of Graphene/SiO_2 interface KUN XU, Purdue University, National Institute of Standard and Technology, CAIFU ZENG, KANG WANG, University of California, Los Angeles, QIN ZHANG, National Institute of Standard and Technology, PEIDE YE, Purdue University, RUSEN YAN, ALAN SEABAUGH, HUILI XING, University of Notre Dame, JOHN SUEHLE, CURT RICHTER, DAVID GUNDLACH, NHAN NGUYEN, National Institute of Standard and Technology — Advancing toward the rational design, fabrication, and implementation of graphene(GR)-based electronic and optical devices, the intrinsic barrier height of undoped GR (the Dirac point of GR to the conduction band(CB) edge of an insulator), as well as the intrinsic work function(WF) of GR must be accurately determined. We present an internal photoemission (IPE) investigation of a unique semi-transparent metal/high-k/GR/SiO_2/Si structure, and focus our study on the photoemission phenomena at the GR/SiO_2 interface. By taking advantage of the optical interference of the SiO_2 cavity, the enhanced photoemission from GR was observed. As a result, a complete electronic band alignment at the GR/SiO_2/Si interfaces is established. The intrinsic positions of the undoped GR Dirac point with respect to the CB of SiO_2, 3.58 eV (Al_2O_3 TG) and 3.60 eV (HfO_2 TG), are obtained. The intrinsic WF of graphene is found to be 4.50 eV. The determination of the WF of GR is of significant importance to the engineering of GR-base devices and the IPE spectroscopy, combined with specific interference cavity structures, would be a valuable measurement technique for other GR-like2-D material systems.

Nhan Nguyen
NIST

Date submitted: 15 Nov 2012 Electronic form version 1.4