Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Characterization of the junction between single-walled carbon nanotube films and silicon substrates NISCHAL ARKALI RADHAKRISHNA, ASHKAN BEHNAM, JASON JOHNSON, ANT URAL, University of Florida —
We experimentally characterize the junction between single-walled carbon nanotube (CNT) films and both n-type and p-type Si substrates. We prepare CNT films by vacuum filtration, transfer them onto Si substrates and pattern them by photolithography and reactive ion etching. We also fabricate control samples, in which the CNT film is replaced with a Ti/Au metal stack for comparison. We characterize these devices by dark and photo $I-V$ and $C-V$ measurements at various temperatures. Our dark $I-V$ measurements reveal that the CNT film forms a Schottky contact with an average barrier height of 0.44 $\pm$ 0.03 eV and 0.6 $\pm$ 0.02 eV on p-type and n-type Si, respectively. Average ideality factors and series resistances (normalized with area) are also extracted for both the n- and p-type CNT film-Si junctions. Furthermore, photocurrent measurements at reverse bias result in responsivity and normalized photo to dark current ratio of 0.197 A/W and 7.11×10^4 mW^{-1} respectively at a bias of 3 volts. $C-V$ measurements verify the barrier heights extracted from $I-V$measurements. These results extract the important parameters of CNT film-Si junctions and facilitate the application of CNT films as Schottky electrodes in conventional semiconductor electronic and optoelectronic devices.

Ant Ural
University of Florida

Date submitted: 24 Nov 2009 Electronic form version 1.4