Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Charge Injection Mechanism at Carbon Nanotube-Organic Semiconductor Interface[1] BIDDUT K. SARKER, Nanoscience Technology Center and Department of Physics, University of Central Florida, SAIFUL I. KHONDAKER, Nanoscience Technology Center, Department of Physics, and School of Electrical Engineering and Computer Science, University of Central Florida — One of the major challenges in the fabrication of high performance organic electronic devices is to overcome the inefficient charge injection from metal electrodes into organic semiconductors caused by large interfacial contact barrier. One potential key step of improving the charge injection is to employ single-walled carbon nanotubes as electrodes. Towards this end, we fabricated pentacene field effect transistor using densely aligned carbon nanotube array electrodes with open-ended and parallel tips. The room temperature electronic transport measurements of the devices show excellent transistor properties with field effect mobility of up to 0.65 cm^2/Vs and current on-off ratio of up to 1.7×10^6, which are higher than that of the control devices fabricated with gold electrodes. The high-performance of the devices is attributed to lower charge injection barrier at carbon nanotubes and pentacene interface. In order to find the direct evidence of the low injection barrier, we carry out low temperature electron transport measurement of our devices. We will present the detailed analysis of the low temperature data.

[1]This work is partially supported by U.S. National Science Foundation under Grant ECCS 1102228

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Date submitted: 12 Nov 2011 Electronic form version 1.4