UNIVERSITY OF CENTRAL FLORIDA

NANOSCIENCE TECHNOLOGY CENTER
ADVANCED MATERIALS PROCESSING & ANALYSIS CENTER

GRADUATE RESEARCH SEMINAR SERIES

Friday
April 10, 2015

12:00 PM — 1:00 PM

Research Pavilion
NSTC
Conference Room 475

Pizza and drinks will be provided

Towards Parallel Fabrication Single Electron Transistors Using Carbon Nanotubes

Muhammad Rakibul Islam (12:00 PM – 12:30 PM)
Dr. Saiful Khondaker's Group

Single electron transistors (SETs) are considered to be promising building blocks for post CMOS era electronic devices, however, a major bottleneck for practical realization of SET based devices is a lack of parallel fabrication approach. Here, we demonstrate a technique for the scalable fabrication of SETs using single-walled carbon nanotubes (SWNTs). The approach is based on the integration of solution processed individual SWNTs via dielectrophoresis (DEP) at the selected position of the circuit with 100 nm channel length where the metal-SWNT Schottky contact work as a tunnel barrier. Measurements carried out at low temperature (4.2K) show that the majority of the devices with contact resistance (R_T) > 100 kΩ display SET behavior. For the devices with 100 kΩ < R_T < 1 MΩ, periodic, well-denned Coulomb diamonds with a charging energy of ~ 14 meV, corresponding to transport through a single quantum dot (QD) was observed. For devices with high R_T (> 1MΩ) multiple QD behaviors were observed. From the transport study of 50 SWNT devices, a total of 38 devices show SET behavior giving a yield of 76%. The results presented here are a significant step forward for the practical realization of SET based devices.

Ternary Solvent Effect in High V_{oc} Polymer Solar Cells

Chao Li (12:30 PM – 1:00 PM)
Dr. Jayan Thomas' Group

Currently, many devices powered by solar cells require high voltage to operate and many polymer solar cells (PSCs) connected in series are required to power them. High V_{oc} solar cells are necessary to reduce the number of cells required to achieve the voltage requirements for these operations. Here, we will describe a simple method to develop a high V_{oc} low band gap PSCs. In addition, two new AFM-based nanoscale characterization techniques are introduced to study the surface morphology and physical properties of the structured active layer. With the help of ternary solvent processing of the active layer and C_{60} buffer layer, a bulk heterojuntion PSC with V_{oc} more than 0.9V and conversion efficiency 7.5% has been developed. To understand the role of ternary solvents on the morphology of the active layer, Pulsed-Force-Mode AFM (PFM-AFM) and Mode-Synthesizing AFM (MSAFM) are used for advanced analysis .