Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Low Temperature Transport in Networks Based on Multi-layer Graphene Nanoribbons ASHKAN BEHNAM, JASON JOHNSON, YANBIN AN, AMLAN BISWAS, ANT URAL, University of Florida — We fabricate and characterize networks composed of narrow but long multi-layer graphene nanoribbons. Fabrication is based on chemical processing of expandable graphite and vacuum filtration of the produced ribbons. We analyze the structure of the networks by various electron and optical imaging techniques, then pattern the networks into four point probe structures using photolithography and plasma etching and measure their resistivity down to 4.2 K. Due to the disordered nature of the networks, resistivity depicts insulating behavior explained by Mott Variable Range Hopping (VRH) at low temperatures. We also investigate the dependence of the network resistivity on electric and magnetic fields. VRH theory can explain most of the magnetoresistance data, although carrier-carrier interaction also becomes important at high fields and the lowest temperatures. Resistivity also decreases sharply at electric fields higher than 10 V/cm. A high localization radius is extracted from this dependence, which is likely due to the high conductance of the nanoribbons and/or good electrical contact between them. The multi-layer graphene nanoribbon networks depict favorable electrical properties that advocate their use for applications such as bolometers, photodetectors, and gas sensors.

Ashkan Behnam
University of Florida

Date submitted: 24 Nov 2009 Electronic form version 1.4