SYNTHESIS AND CHARACTERIZATION OF CARBON NANOTUBES PRODUCED FROM THERMAL DECOMPOSITION OF NICKELLOCENE

B. Muchharla[1], H. Vinson[1], X. F. Zhang[1], A. Church[1], V. Krungleviciute[1], S. Kar[2], A. D. Migone[1], S. Talapatra[1]

[1]Department of Physics, Southern Illinois University Carbondale, IL-62901
[2]Department of Physics, Northeastern University, Boston, MA-02115

Over the past two decades investigations pertaining to various properties of carbon nanotubes (CNTs) have indicated that they are one of the most promising engineering materials available today for future technology development. However, deploying these materials in developing a wide variety of applications will require large volume production of CNTs. For example applications such as battery electrode additives, multi-functional composites, supercapacitor electrodes, field emission displays/lighting – CNT-based inks for printing etc. will require large amounts of CNT materials in the form of thick films, random network, assembled sheets and fibers. Therefore, simple and cost effective techniques for bulk production of CNTs in forms of thin films, self assembled network or sheets are being explored vigorously since these architectures will possess physical properties such as high strength, low density, high specific surface area, good thermal and electrical conductivity needed for most of the aforesaid applications. We have employed a direct thermal deposition technique, which used Nickellocene both as the catalyst as well as the carbon source, to grow films of carbon nanotubes (CNT). The CNT films obtained using this procedure were characterized using Transmission Electron Microscopy which indicated the presence of thin diameter carbon nanotubes as well as single walled CNT ropes. Volumetric adsorption measurements were performed to determine the porosity and specific surface areas of these samples. Electrical transport measurements performed on long ropes of CNTs extracted from these bulk films will be presented and will be discussed in the framework of transport theories of quasi-one dimensional systems.