

Contribution ID: 249

Type: Oral Presentation

Electronic transport in a rope of metal filled single walled carbon nanotubes

Thursday, 12 July 2012 14:30 (20 minutes)

Abstract content
 (Max 300 words)

Filling of single walled nanotubes (SWNT) with chosen materials opens new possibilities of generating a nearly one dimensional structure by encapsulating a nanowire into a nanotube with a very small diameter. To date researchers have done considerable work on filling multi- and double walled nanotubes due to their larger diameters compared to SWNT's. SWNT's provide a platform to study the nanowire-nanotube interaction. High purity SWNT's were synthesized by laser ablation and filled by a wet chemistry technique. Filling efficiency was investigated through electron microscopy.Raman spectroscopy studies showed a shift in the radial breathing mode frequencies indicating a decrease in diameter as the metal is encapsulated into the nanotube. We investigated the electronic and magnetic properties of individual and bundled nickel filled SWNT's using low temperature and magneto-resistance studies. The bundle of tubes exhibits semimetallic behavior with a T² temperature dependence. A very small energy gap has been observed in the I-V characteristics of these samples which show step like features related to resonant tunneling phenomena. On the other hand individual tubes showed a metallic nature from 300K down to 140K and a weakly activated conduction at low temperatures, below 140K complimented by the non exponential I-V characteristics. This study can be used to develop an understanding of the metal-nanotube interaction and the overall effect of the filler material on the electronic and magnetic properties of SWNT for nanoelectronic and spintronic applications.

Apply to be
 consider for a student
 award (Yes / No)?

No

Level for award
 (Hons, MSc,
 PhD)?

MSC

Main supervisor (name and email)
and his / her institution

Somnath Bhattacharyya, Somnath.Bhattacharyya@wits.ac.za, University of the Witwatersrand

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

No

Primary authors: Mr COLEMAN, Christopher (University of the Witwatersrand.); Dr MOODLEY, Matthew (University of Kwazulu Natal); Ms NCUBE, Siphephile (University of the Witwatersrand.); Prof. BHATTACHARYYA, Somnath (University of the Witwatersrand.)

Presenter: Ms NCUBE, Siphephile (University of the Witwatersrand.)

Session Classification: DCMPM1

Track Classification: Track A - Division for Condensed Matter Physics and Materials