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

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### Abstract content <br> &nbsp; (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  $T^{>2}</sup>$  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<br> consider for a student <br> &nbsp; award (Yes / No)?

No

### Level for award<br>&nbsp;(Hons, MSc, <br> &nbsp; PhD)?

MSC

### Main supervisor (name and email)<br>and his / her institution

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

No

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