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Tuning the electrical transport properties of carbon nanotubes (MWNTs and DWNTs) through semiconductor, semi-metal and metal filling

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Abstract content
   (Max 300 words)

Modifying and improving the electrical transport properties of CNTs is an essential prerequisite for nano-electronic device applications of these novel materials. From low temperature and magneto resistance studies we reveal the tuneable transport properties of filled double walled carbon nanotubes (DWNTs) networks and a characteristic, one dimensional semi-metallic behaviour in metal filled multi-walled carbon nanotubes (MWNTs). A transition from a predominantly hopping transport in unfilled DWNTs to weakly activated and semi-metallic behaviour is observed in DWNTs filled with mercury telluride (HgTe@DWNTs) and selenium (Se@DWNTs) respectively. The results are explained in terms of the interaction between the host CNTs and the filler material and this is further consolidated with extensive micro Raman studies. A weak temperature dependence of the inelastic scattering lengths in metal filled MWNTs was also observed which suggests the existence of one dimensional conduction channels due to the presence of long nano-wires at the core of the tubes. We sum the whole study with a conduction mechanism that illustrates the interplay between the inner and outer shells of the tubes and their respective interaction with the filler material.

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Yes

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PhD

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