

Electronic Properties of Metallofullerene-Peapods

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Electronic properties of Gd@C82 metallofullerene peapods, (Gd@C82) n@SWNTs, are investigated by electron energy-loss spectroscopy (EELS), scanning tunneling microscopy and spectroscopy (STM/STS) and field-effect transistors (FETs) transport measurements. The results indicate that the electronic structure of Gd@C82 metallofullerene peapods is completely different from those of intact single-walled nanotubes (SWNTs). For example, Gd@C82-peapods-FETs show ambipolar behavior which is not observed in the empty SWNTs-FETs under our experimental condition. Furthermore, in semiconducting nanotubes the band gap can be varied from ~ 0.5 to ~ 0.1 eV with inserted Gd@C82 endohedral metallofullerenes with spatial periodicity of 1.1 nm to 8.0 nm, depending on the density of the fullerenes. The present findings suggest that metallofullerene peapods may point the way toward novel electronic devices.