High selectivity of pure semiconductor single walled carbon nanotubes for optoelectronic telecom applications

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Abstract

We report a detailed protocol for selecting very pure large diameter semiconductor single walled carbon nanotubes (s-SWNTs) with fundamental transition centered at 1550 nm. We use poly[(9,9-dihexylfluorenyl-2,7-diyl)-co-(9,10-anthracene)] (PFH-A), producing samples with narrow and bright excitonic emission in toluene solution. Optimized sonication and centrifugation protocols are used to eliminate any trace of metallic carbon nanotubes. We characterize the samples both with optical and electrical measurements. Bright and sharp exciton emissions are eventually found even from dried s-SWNTs after deposition with drop cast method on quartz. We exploit the Resonant Raman spectroscopy to increase the detectability of residual presence of metallic single walled carbon nanotubes (m-SWNTs). Demonstration of the complete absence of m-SWNTs is obtained also by electrical measurements on carbon nanotube transistors with different channel lengths. Our findings pave the way to exploit s-SWNTs for optoelectronic devices in the telecom wavelengths.

This work was funded by the European Union through the FP7 Project CARTOON (Contract FP7 -618025).