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Semiconducting SWCNT: From materials to thin film transistors

Zhao Li, Patrick R L Malenfant, Jianfu Ding and **Jacques Lefebvre**
National Research Council Canada, Canada

Significant progress has been made in the last ten years on the topic of separating semiconducting (SC) from metallic single walled carbon nanotubes (SWCNTs). Techniques such as conjugated polymer extraction (CPE), chromatography and density gradient ultracentrifugation (DGU) have been shown to be particularly effective at SC-SWCNT enrichment. As a result, the fabrication of thin film transistors comprising enriched SC-SWCNTs has been undertaken by several research teams in hopes of obtaining higher performance printed logic, display drivers and novel sensors. We have compared DGU, chromatography and CPE and found the later to have many positive attributes such as a competitive cost model, scalability and product quality. Our recent progress and commercialization (IsoSol-S100TM) of the CPE method to produce high purity SC-SWCNTs dispersed in organic solvents will be presented. We also developed a novel methods using Raman mapping to quantify SC-SWCNT purity beyond 99%. After fine-tuning the substrate surfaces and SWCNT/polymer solution property, uniform and high density tube network was obtained. Thin film transistor (TFT) based on SC-SWCNT as active channels demonstrate both high mobility and on/off ratio. Application of this kind of solution as ink for inkjet printing will also be addressed.

Biography

Zhao Li has completed his PhD in 2000 from Chinese Academy of Sciences and then pursued his 3 years Postdoctoral studies in Calgary University in Canada. He has joined Canadian Research Council in 2003 and presently he is a Research Council Officer. His research is focused on conjugated polymer synthesis and characterization, organic photovoltaics, carbon nanomaterials and its application in thin film transistors. He has published more than 35 papers in reputed journals.

Zhao.Li@nrc.gc.ca

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Page 33