Seperation of SWNT via hydroxyl group reaction

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Self-Selective Separation of Single-Walled Carbon Nanotubes via a Hydroxyl Group Reaction

We developed a method of separating metallic single-walled carbon nanotubes (SWNTs) from semiconducting nanotubes (NTs) in suspension using a sodium hydroxide treatment and centrifugation. The semiconducting NTs remained suspended in the solvent while the metallic NTs precipitated out. This self-selective separation occurred because the metallic SWNTs bonded to hydroxyl groups due to strong surface hydrogen-bond interactions. We fabricated thin-film transistors based on random networks of semiconducting SWNTs on a glass substrate and obtained an on/off current ratio of 6.25 x 10^4.

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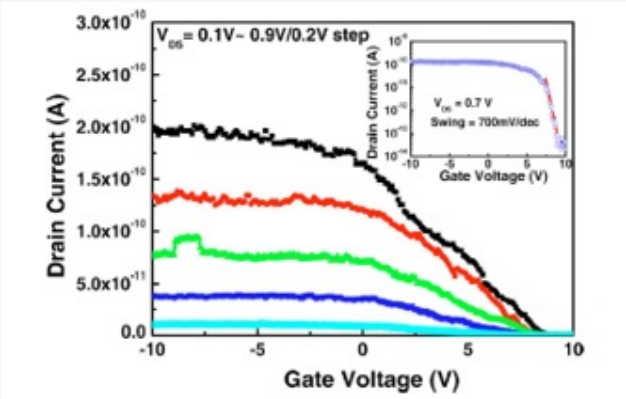

Figure 6. (Color online) *I-V* characteristics of semiconducting SWNT TFT as a function of drain voltage. The inset shows the log-scale *I-V* characteristics at V_{DS} of 0.7 V.

Figure 6 shows the current–voltage I-V curve characteristics of the SWNT TFT as a function of drain–source voltage V_{DS} to illustrate the electrical characteristics of the semiconducting SWNT TFT in detail. The gate voltage V_G varied over the 10 V range. The SWNT TFT behaved normally as a p-channel transistor. The on/off current ratio increased rapidly as V_{DS} increased. The inset shows that the maximum transconductance $g_m = dI_D/dV_G$ was about 6.4 x 10^{-11} A/V, and the on/off current ratio was approximately 6.25 x 10^4. The subthreshold slope {$S = dV_G / [d(\log_{10} I_D)]$} was about 700 mV/decade at a V_{DS} of 0.7 V. Thus, this method could be very useful for random networks of SWNT electronics.

Keywords

Carbon nanotubes;Nanotube devices;Precipitation;Semiconductor nanotubes