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Atomic structure of DWNTs from methane FC-CVD synthesis

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Abstract:

We present CNTs from methane-based FC-CVD. Based on the Fe-C-S system, the double-wall CNTs (DWCNTs) with a mean diameter of 4.15 nm and a mean bundle length of 20 um have been synthesized. After gold chloride solution doping, the DWNT based transparent conducting films show an excellent performance of 42 ohm/sq sheet resistance at 90% transmittance, and 35 ohm/sq when doped with HNO3. These high-performance DWNTs films have an ultra-high yield i.e. production rate, being two orders of magnitude higher than that of SWNT based TCFs with similar performance. The DWNTs films contain 'small' bundles with around 50% of CNTs being individual. Interestingly, the large-diameter DWNTs seem to flatten at the junctions, which can provide a larger contact area between the tubes and accordingly reduce the contact resistance between the tubes.

In addition, we report recent results on DWNT non-transparent line based TCFs. When the DWNT line width is around 250 micrometers and the lines cover 10 % of the electrode area, i.e. the transmittance is 90 %, the sheet resistance after AuCl3 doping is as low as 2 ohms/sq.

Finally, we discuss the atomic structures i.e. (n,m) distributions as determined with the electron diffraction of individual DWNTs. We find broad chiral angle distributions and no correlation between the chiral angles of the inner and outer walls.

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主催：
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