

The influence of Fe/Al multilayer catalyst in the synthesis high-quality single-walled carbon nanotubes

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The high quality single-walled carbon nanotubes (SWNTs) were synthesized by utilizing the Fe/Al multilayer catalyst on silicon oxide substrate using thermal chemical vapor deposition method. The methane (CH₄) mixed with ethylene (C₂H₄) were fed into the reactor for the synthesis of SWNTs. During the formation of SWNTs at high temperatures (~900°C), the nanoparticles of Fe₂O₃ are completely reduced, resulting in the formation of nanoparticles of Fe, on the surfaces of SiO₂. In addition, the Al underlayer appears to increase the surface roughness and the act as a suitable underlayer to stabilize the nanosized Fe for SWNTs growth. The density of CNTs could be controlled through the thicknesses of both the Al layer and Fe catalyst layer. Field emission scanning electron microscopy and Raman analysis are used to characterize the SWNTs.

Keywords Single-walled carbon nanotube, thermal chemical vapor deposition, Fe/Al multilayer catalyst

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