Catalytic CVD Synthesis of Single-Walled Carbon Nanotubes from Fullerene

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Single-walled carbon nanotubes (SWNTs) were synthesized by a catalytic CVD technique using fullerene as the carbon source. Powder of C$_{60}$ in a quartz test tube and Fe/Co catalyst supported with zeolite on a quartz plate were placed separately in a quartz tube with two electric furnaces. While the catalyst was heated up to the desired temperature, more than 200 sccm Ar gas flow was kept. After the catalyst reached the desired temperature, Ar gas was evacuated and powder of C$_{60}$ was heated up to the certain high temperature with vacuum pump on, and vapor phase C$_{60}$ was supplied over the catalyst. After cooling down, the sample was analyzed by resonant Raman spectroscopy and transmission electron microscopy (TEM). Raman spectra indicated that the high-purity synthesis of SWNTs from C$_{60}$ was possible and that the nanotube diameter distribution was much narrower than other SWNTs generated by conventional catalytic CVD techniques. Most of SWNTs was observed as thin bundles from TEM observations.