GROWTH MODE SELECTION BETWEEN BASE-TYPE CARBON NANOTUBES AND TIP-TYPE CARBON NANOFIBERS BY PLASMA-ENHANCED CHEMICAL VAPOR DEPOSITION

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Abstract

Base-type carbon nanotubes (CNTs) and tip-type carbon nanofibers (CNFs) have been selectively grown by a dc plasma-enhanced chemical vapor deposition (PECVD) technique. Growth mode selection was reproducibly achieved by adjusting the catalyst film thickness and NH3 pretreatment plasma current. The vertically aligned behavior of CNT was systematically studied by using a fine-patterned catalyst layer with diverse critical dimensions. These CNTs and CNFs showed distinctive properties in structure, growth rate and vertical alignment, which were confirmed by scanning electron microscopy (SEM), transmission electron microscopy (TEM), and in situ optical interference measurement. Freestanding single CNT was successfully realized by optimum tip-type CNTs growth, conventional photolithography and wet-etch process.

Keywords: Carbon nanotubes, carbon nanofibers, growth mode, PECVD, growth rate

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