Abstract Submitted
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Chirality-controlled synthesis of single-wall carbon nanotubes using vapour phase epitaxy[1] JIA LIU, Department of Chemistry, University of Southern California, CHUAN WANG, Department of Electrical Engineering, University of Southern California, XIAOMIN TU, NIST, BILU LIU, LIANG CHEN, Department of Electrical Engineering, University of Southern California, MING ZHENG, NIST, CHONGWU ZHOU, Department of Electrical Engineering, University of Southern California, NIST COLLABORATION — Due to the superior electrical properties such as high intrinsic carrier mobility and current-carrying capacity, single wall carbon nanotubes (SWCNT) hold great promise for electronic application. Since the electronic property of a SWCNT strongly depends on its chirality, the lack of synthetic control in chirality has long been recognized as a fundamental impediment in the science and application of SWCNTs Here we demonstrate a general strategy for producing carbon nanotubes with predefined chiralities by using purified single-chirality nanotubes as seeds for subsequent metal-catalyst-free growth, resembling vapour phase epitaxy commonly used for semiconductor films. In particular, we have successfully synthesized (7, 6), (6, 5), and (7, 7) nanotubes, and used Raman spectroscopy to show unambiguously that the original chiralities of the nanotube seeds are preserved. Furthermore, we have performed electrical measurements on synthesized individual (7, 6) and (6, 5) nanotubes, confirming their semiconducting nature. The vapour phase epitaxy approach is found to be highly robust and should enable a wide range of fundamental studies and technological developments.

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