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Modulating diameter of single-walled carbon nanotubes in alcohol catalytic chemical vapor deposition RONG XIANG, KEHANG CUI, HUA AN, XIAO CHEN, SHOHEI CHIASHI, SHIGEO MARUYAMA, Department of Mechanical Engineering, the University of Tokyo — Modulating the diameter of a single walled carbon nanotube (SWNT) is essential for its applications in optical and electronic devices. We demonstrate that the average diameter of vertically aligned SWNTs can be successfully reduced from 2.5 to 1.2 nm by changing catalyst component ratio in a Co/Mo bimetallic system, no matter the catalyst is dip-coated or spray-coated onto a substrate. Meanwhile, the diameter can be further reduced after replacing the conventional ethanol carbon source by acetonitrile. Recently, Cu is found to be effective in reducing diameter in alcohol catalytic chemical vapor deposition, and sub-1-nm SWNTs are achieved using this novel Co/Cu combination. Diameter modulation is confirmed by Raman spectroscopy, optical absorption spectroscopy and transmission electron microscopy. The structure and element distribution in Co/Cu catalyst is also investigated.

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