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Diameter and Geometry Control of Vertically Aligned SWNTs through Catalyst Manipulation RONG XIANG, ERIK EINARSSON, JUN OKAWA, YOICHI MURAKAMI, SHIGEO MARUYAMA, Department of Mechanical Engineering, The University of Tokyo — We present our recent progress on manipulating our liquid-based catalyst loading process, which possesses greater potential than conventional deposition in terms of cost and scalability, to control the diameter and morphology of single-walled carbon nanotubes (SWNTs). We demonstrate that the diameter of aligned SWNTs synthesized by alcohol catalytic CVD can be tailored over a wide range by modifying the catalyst recipe. SWNT arrays with an average diameter as small as 1.2 nm were obtained by this method. Additionally, owing to the alignment of the array, the continuous change of the SWNT diameter during a single CVD process can be clearly observed and quantitatively characterized. We have also developed a versatile wet chemistry method to localize the growth of SWNTs to desired regions via surface modification. By functionalizing the silicon surface using a classic self-assembled monolayer, the catalyst can be selectively dip-coated onto hydrophilic areas of the substrate. This technique was successful in producing both random and aligned SWNTs with various patterns. The precise control of the diameter and morphology of SWNTs, achieved by simple and scalable liquid-based surface chemistry, could greatly facilitate the application of SWNTs as the building blocks of future nano-devices.

Rong Xiang
xiangrong@photon.t.u-tokyo.ac.jp
Department of Mechanical Engineering, The University of Tokyo

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