

Abstract Submitted
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Growth of Single-Walled Carbon Nanotubes by High Melting Point Metal Oxide Catalysts¹ YANG QIAN, RONG XIANG, HUA AN, TAIKI INOUE, SHOHEI CHIASHI, Department of Mechanical Engineering, The University of Tokyo, SHIGEO MARUYAMA, Department of Mechanical Engineering, The University of Tokyo; National Institute of Advanced Industrial Science and Technology (AIST) — We report on the growth of single-walled carbon nanotubes (SWNTs) from Co oxide catalysts. The concept is using the relatively lower mobility of metal oxide (than metal) to suppress catalyst aggregation at high temperatures. Compared to the SWNTs grown by pre-reduced catalysts, SWNTs grown from oxidized Co catalysts have shown narrower diameter distribution and smaller average diameter. Different growth parameters are discussed regarding the resulting morphology of SWNTs. Transmission electron microscopy (TEM) investigations reveal the information that Co catalysts are transformed to Co₃O₄ after reduction-calcination process. X-ray photoelectron spectroscopy (XPS) investigations indicate that Co₃O₄ has decomposed to CoO before growth at a typical growth temperature (800 C) in Ar atmosphere. We propose that CoO has higher melting point than Co and thus is more stable during the growth. Our results indicate that besides the bimetallic catalysts, monometallic catalytic system could also be useful in stabilizing the catalysts to grow chirality-specific SWNTs by transforming the relatively low melting point metal catalysts to high melting point metal oxide catalysts.

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