World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:9, No:04, 2015

Growth of SWNTs from Alloy Catalyst Nanoparticles

Authors : S. Forel, F. Bouanis, L. Catala, I. Florea, V. Huc, F. Fossard, A. Loiseau, C. Cojocaru

Abstract : Single wall carbon nanotubes are seen as excellent candidate for application on nanoelectronic devices because of their remarkable electronic and mechanical properties. These unique properties are highly dependent on their chiral structures and the diameter. Therefore, structure controlled growth of SWNTs, especially directly on final device's substrate surface, are highly desired for the fabrication of SWNT-based electronics. In this work, we present a new approach to control the diameter of SWNTs and eventually their chirality. Because of their potential to control the SWNT's chirality, bi-metalics nanoparticles are used to prepare alloy nanoclusters with specific structure. The catalyst nanoparticles are pre-formed following a previously described process. Briefly, the oxide surface is first covered with a SAM (self-assembled monolayer) of a pyridine-functionalized silane. Then, bi-metallic (Fe-Ru, Co-Ru and Ni-Ru) complexes are assembled by coordination bonds on the pre-formed organic SAM. The resultant alloy nanoclusters were then used to catalyze SWNTs growth on SiO2/Si substrates via CH4/H2 double hot-filament chemical vapor deposition (d-HFCVD). The microscopy and spectroscopy analysis demonstrate the high quality of SWNTs that were furthermore integrated into high-quality SWNT-FET.

Keywords : nanotube, CVD, device, transistor
Conference Title : ICNN 2015 : International Conference on Nanoscience and Nanotechnology
Conference Location : Paris, France
Conference Dates : April 27-28, 2015

Open Science Index, Materials and Metallurgical Engineering Vol:9, No:04, 2015 publications.waset.org/abstracts/23788.pdf