[II-8]

Synthesis of self-aligned carbon nanotubes on a Ni particles using Chemical Vapour Deposition

Gyuseok Choi, Jongman Yoon, Yusuk Cho and Dojin Kim
Department of Materials Engineering, Chungnam National University

Since its discovery in 1991, the carbon nanotube has attracted much attention all over the world; and several methods have been developed to synthesize carbon nanotubes. According to theoretical calculations, carbon nanotubes have many unique properties, such as high mechanical strength, capillary properties, and remarkable electronical conductivity, all of which suggest a wide range of potential applications in the future.

Here we report the synthesis of aligned carbon nanotubes on Ni particles.

Carbon nanotubes were synthesized in the catalytic decomposition of acetylene at ~650° C over Ni deposited on SiO_2. For the catalyst preparation, Ni was deposited to the thickness of 100-300A using effusion cell.

Different approaches using porous materials and HF or NH3 treated samples have been tried for synthesis of carbon nanotubes. It is decisive step for synthesis of carbon nanotubes to form a round Ni particles. We show that the formation of round Ni particles by heat treatment without any pre-treatment such as chemical etching and observe the similar size of Ni particles and carbon nanotubes. Carbon nanotubes were synthesized by chemical vapour deposition using C2H2 gas for source material on Ni coated Si substrate. Ni film having 20~90nm thickness was changed into Ni particles with 30~90nm diameter. Heat treatment of Ni fim is a crucial role for the growth of carbon nanotube. High-resolution transmission electron microscopy images show that they are multi-walled nanotube. Raman spectrum shows its peak at 1349cm-1(D band) is much weaker than that at 1573cm-1(G band). We believe that carbon nanotubes contains much less defects.

Long carbon nanotubes with length more than several μm and the carbon particles with round shape were obtained by CVD at ~650℃ on the Ni droplets. SEM micrograph showing carbon nanotubes grown under different conditions. also, alignment of carbon nanotubes was identified by SEM.

Finally, we performed TEM analysis on the carbon nanotubes to determine whether or not these film structures are truly carbon nanotubes, as opposed to carbon fiber-like structures.