

Synthesis of crystalline carbon nanotube arrays on AAO templates using catalyst reduction with low pressure TCVD

Yong Sook Shin, Ji Hoon Yang, Min Hyung Yum, Chong-Yun Park, Myeung Hoi Kwon*,
Ji-Beom Yoo**, Chul Woong Yang**, Se Jin Kyung**, and Geun Young Yeom**

Center for Nanotubes and Nanostructured Composites, Department of Physics, and Institute of Basic Science, Sungkyunkwan University, *Physics Department, University of Incheon, **Center for Nanotubes and Nanostructured Composites, School of Metallurgy and Materials Engineering, Sungkyunkwan University

Well-aligned crystalline carbon nanotubes (CNTs) were synthesized on anodic aluminum oxide (AAO) templates using low-pressure thermal chemical vapor deposition (TCVD). The AAO templates were fabricated using an anodization process, and an Fe catalyst was electrochemically deposited inside the bottom of the pores on the AAO template. Additional pore widening and catalyst reduction were performed to separate the catalytic actions of the pore wall and Fe catalysts. Owing to the enhancement of the catalytic reaction between C_2H_2 and the Fe catalyst particles, CNTs with good crystallinity and a high packing density were grown without the deposition of amorphous carbon on the pore surface of the AAO templates. The diameter and density of the CNTs were approximately 60 nm (similar to that of the Fe catalyst particles) and 7×10^9 CNTs/cm², respectively. When the threshold voltage of the electron emission was measured with a gap of 400 μ m, it showed a very low turn-on field of 0.65 V/ μ m and the field enhancement factor was greater than 7500.