Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

First Success on Growing Boron Nitride Nanotubes on Substrates

YOKE KHIN YAP, JIESHENG WANG, VIJAYA KAYASTHA, Michigan Technological University — We report on the first success of growing boron nitride nanotubes (BNNTs) on Si substrates at 600 $^\circ$C. BNNTs are expected to have a band gap of 5.5 eV, which is independent of the tube diameter, number of walls, and chirality. Furthermore, it is possible to tune this band gap down to $\sim$1.3 eV by substitution of carbon. Previously, BNNTs have been synthesized by arc discharge, laser ablation, and chemical pyrolysis, typically at growth temperatures >1100 $^\circ$C. These products are in a powder form with impurities including catalyst and BN particles. Now, we succeeded on the patterned growth of BNNTs at 600 $^\circ$C. These BNNTs are grown by a RF-plasma assisted pulsed-laser deposition (PLD) technique. The growth of BNNTs is sensitive to the types of catalysts used, plasma density, growth temperatures, and laser pulsed energy. The growth sites of BNNTs are highly controllable by the catalyst. At optimum condition, a well-defined growth region of BNNTs has been identified and explained. According to high-resolution field-emission scanning electron microscopy (FESEM), these BNNTs are grown vertically aligned on the substrates in a base growth mode. This is confirmed by high-resolution transmission electron microscopy (HRTEM). These BNNTs are constructed of well-defined tubular structures with diameters $\sim$10 to 20 nm.

Yoke Khin Yap
Michigan Technological University

Date submitted: 24 Nov 2004 Electronic form version 1.4