

STM/AFM imaging of DNA-CNT conjugated structures

Danda P. Acharya¹, Wei Lu², Anthony Canterbury¹, Liwei Chen², and Saw-W. Hla¹

¹Department of Physics & Astronomy, Nanoscale and Quantum Phenomena Institute

²Department of Chemistry & Biochemistry, Athens, OH-45701, USA

Single stranded DNA (ssDNA) interacts strongly with carbon nanotubes (CNTs) to form a stable DNA-CNT hybrid that effectively disperses CNTs in aqueous solution. In our experiment, ss-DNA oligonucleotide with a repeating G-T sequence was used. Atomic Force Microscopy and Low Temperature Scanning Tunneling Microscopy are used to image the structures of DNA-CNT on gold substrate. Our experimental result shows an entangled DNA with CNT. The Voltage dependent LT-STM images demonstrate that DNA molecules become transparent at low bias voltages at constant current mode. The DNA-CNT mixture was kept in an ice-water bath and sonicated for 120 min at a power level of 8 W. Because the ss-DNA has non covalent bonding to the nanotube sidewall, the ss-DNA can hydrogen bond with itself to form ds-DNA, forming the ds-DNA wrapped CNT structures. The sample is deposited on the gold substrate at room temperature.

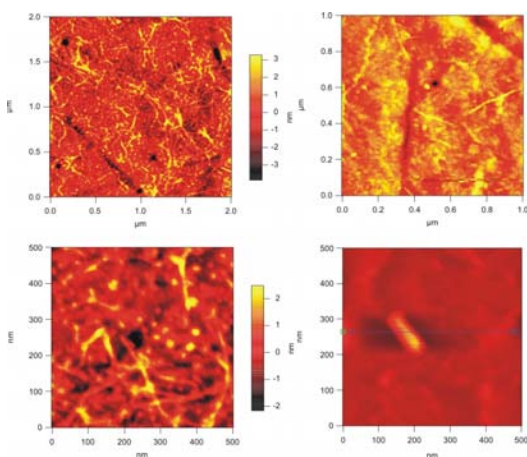


Fig. (1)

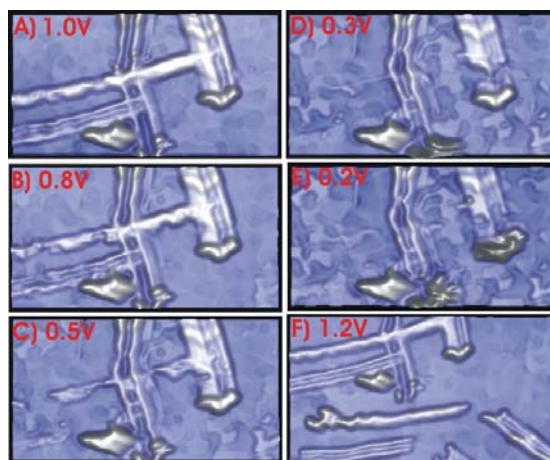


Fig. (2)

Fig. (1) Shows the AFM image of DNA-CNT at 300K. The contrast shows the height of DNA-CNT. **Fig. (2)** Shows the STM image of DNA-CNT at 78K. The full height of DNA is ~1nm. Image parameters $I=0.38\text{nA}$ and image size= 260nmx140nm (A-E).