Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Tunable Encapsulation Structure of Block Copolymer Coated SWNTs in Aqueous Solution YOUNGKYU HAN, SUK-KYUN AHN, ZHE ZHANG, GREGORY S. SMITH, CHANGWOO DO, Oak Ridge National Laboratory — Nano-sized and shape-tunable molecular building blocks can provide great opportunities for the fabrication of precisely controlled nanostructures. In this work, we have fabricated a molecular building block of single-walled carbon nanotubes (SWNTs) coated by block copolymers whose encapsulation structure can be controlled via temperature or addition of small molecules. The structure and optical property of SWNT-block copolymer have been investigated by small angle neutron scattering (SANS), ultraviolet-visible (UV-vis) spectroscopy, atomic force microscopy (AFM), and molecular dynamics (MD) simulation. The structure of hydrated block copolymer layer surrounding SWNT can be controlled reversibly by varying temperature as well as irreversibly by adding 5-methylsalicylic acid (5MS). Increasing hydrophobicity of the polymers with temperature and strong tendency of 5MS to interact with both block copolymers and π orbitals of SWNTs are likely to be responsible for the significant structural change of the block copolymer encapsulation layer. Our result shows an efficient and simple way to fabricate and manipulate carbon-based nano building blocks in aqueous systems with tunable structure.

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Date submitted: 14 Nov 2014 Electronic form version 1.4