Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Optical Characterization of Double-walled Carbon Nanotube and Quantum Dot Heterostructures MATTHEW SFEIR, Brookhaven National Laboratory, XIAOHUI PENG, Stony Brook University, STANISLAUS WONG, JAMES MISEWICH, Brookhaven National Laboratory — We experimentally study the optical properties of double-wall carbon nanotube and quantum dot (QD) composites. The two materials are covalently linked by an aminoethanethiol ligand (AET), which, when in complex with the QD, gives a characteristic emission in the NIR originating from trap states. The magnitude of this NIR emission peak relative to the QD exciton peak is directly proportional to the quantity of linker in the solution. Studies of the AET ligand-exchanged QD alone show that it poorly passivates the surface of the QD, leading to a short and complex multiexponential exciton lifetime, characteristic of the existence of randomly distributed surface traps. In contrast, upon linking with the DWNT complex, the defect related emission disappears, leaving only exciton emission. More striking, the exciton emission recovers a nearly monoexponential behavior of $\sim$ 2.8 ns.

Matthew Sfeir
Brookhaven National Laboratory

Date submitted: 19 Nov 2009 Electronic form version 1.4