Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Non-destructive optical characterization of DNA-wrapping of single-walled carbon nanotubes S.E. SNYDER, S.V. ROTKIN, Lehigh University — Single-stranded DNA can form a stable hybrid structure with a single-walled carbon nanotube, allowing dispersion of individual nanotubes in aqueous solution and facilitating the development of methods to separate nanotubes by type. Optical and electronic properties of specific DNA-nanotube structures are the focus of our study due to potential optoelectronic device applications. Within a semi-empirical tight-binding approach, we have studied changes in optical absorption of a single-walled carbon nanotube resulting from a helical wrap of ionized single-stranded DNA. The one-electron absorption spectrum for light polarized across the tube is sensitive to bandstructure modulation due to the wrapping. For a non-chiral tube, the helical perturbation generates "natural" optical activity in the DNA-nanotube complex, yielding circular dichroism. Symmetry breaking due to the Coulomb potential of the wrap lifts optical selection rules and allows new optical transitions. These optical effects are predicted to serve as qualitative tools to directly identify DNA wrapping.

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Date submitted: 12 Dec 2007 Electronic form version 1.4