Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Effects of Exciton-Exciton Annihilation in Fluorescence of Individual SWCNTs ANNI SIITONEN[1], SERGEI BACHILO, DMITRI TSYBOULSKI, R. BRUCE WEISMAN, Rice University — Most studies of SWCNT exciton relaxation have been performed on bulk samples, with clear conclusions hampered by the variety of structural types, lengths, and aggregation states. To avoid such problems, we use near-IR fluorescence microscopy to study nearly pristine individual nanotubes with optically resolvable lengths. We find emission proportional to excitation at low intensities. But for stronger excitation, an increasingly sub-linear dependence is observed, due to exciton-exciton annihilation within single nanotubes. Since annihilation depends on exciton lifetime and mobility, these parameters can be studied by analyzing measured intensity dependences. We compare data on exciton excursion ranges and emission efficiency in individual SWCNTs to numerical simulations to quantify exciton lifetime and diffusion for a variety of (n,m) structures. Preliminary results yield lifetimes of a few nanoseconds for nearly pristine, highly emissive nanotubes and reveal some dependence of lifetime on nanotube diameter.

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Date submitted: 20 Nov 2008 Electronic form version 1.4