Abstract Submitted
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**Diffusion limited optical effects in Single Walled Carbon Nanotubes (SWNTs)**[1] ARUNA RAJAN, Department of Physics, University of Illinois, Urbana Champaign, MICHAEL STRANO, Department of Chemical Engineering, Massachusetts Institute of Technology, TOBIAS HERTEL, Department of Physics and Astronomy, Vanderbilt University, KLAUS SCHULTEN, Beckman Institute for Advanced Science and Technology, and Department of Physics, University of Illinois, Urbana Champaign — Recently, it was observed that SWNTs smaller than a few hundred nm have very low quantum yields. We propose that this is due to thermal diffusion of excitons along the nanotube axis and quenching at the ends. By fitting spectroscopic data to a one-dimensional diffusion model, we extract a diffusion coefficient of 6 $cm^2$/sec for excitons in (7,5) SWNTs. Assuming a mono-exponential decay of exciton photoluminescence, we also predict that the effective length-dependent photoluminescence lifetimes for these excitons lie in the range of 1 ps to 27 ps. Experimental observations are shown to be consistent with stochastic rather than wave packet-like exciton migration, which is in agreement with ultrafast excitonic dephasing. Edge effects seem to limit the use of short SWNTs as optical sensors. Calculation of the form of the diffusion coefficient assuming exciton-phonon coupling as the underlying mechanism will be discussed.

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