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Diffusion-related exciton decay processes in air-suspended single-walled carbon nanotubes studied by photoluminescence microscopy[1] A. ISHII, M. YOSHIDA, Y.K. KATO, The University of Tokyo — In carbon nanotubes, exciton diffusion causes complex photoluminescence properties through end quenching and exciton-exciton annihilation. In order to clarify the effects of these processes in air-suspended carbon nanotubes, where they are isolated from the surroundings, we perform photoluminescence measurements on over a hundred individual nanotubes. Nanotube length dependence is investigated by measuring emission from nanotubes suspended over trenches with various widths[2] and excitation power dependence is also investigated on each nanotube. We analyze the results by calculating the effects of end quenching as a function of the tube length using a first-passage approach.[3] At low excitation powers where the exciton-exciton annihilation is negligible, this model gives intrinsic exciton diffusion lengths and relative values of photoluminescence action cross section. For higher excitation powers, Monte Carlo simulations are used to quantitatively evaluate the exciton-exciton annihilation rates and spatial profiles of the exciton density.

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[2]S. Moritsubo *et al.*, Phys. Rev. Lett. **104**, 247402 (2010).
[3]M. D. Anderson *et al.*, Phys. Rev. B **88**, 045420 (2013).

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