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Electrically driven thermal light emission from individual single-walled carbon nanotubes Y.K. KATO, PRESTO, Japan Science and Technology Agency, D. MANN, A. KINKHABWALA, E. POP, J. CAO, X. WANG, L. ZHANG, Q. WANG, H. DAI, Department of Chemistry and Laboratory for Advanced Materials, Stanford University, J. GUO, Department of Electrical and Computer Engineering, University of Florida — Light emission from carbon nanotubes offer unique opportunities in nano-optoelectronics, because of their chirality dependent electronic structure, availability of high quality electrical contact, and very high aspect ratio. We study electrically- driven light emission from individual single-walled carbon nanotubes, including both quasi-metallic and semiconducting species.[1] Our field effect transistor structure utilizes a clean, as-grown nanotube suspended across a trench, allowing for low contact resistance and good isolation from the substrate. The spectra from quasi-metallic nanotubes reveal pronounced peaks in the visible and infrared corresponding to E_{11} and E_{22} transitions. The emission rates show strong correlation with electrical power dissipated in the devices, consistent with thermally excited emission due to resistive heating. We observe similar behavior for the semiconducting devices, although electroluminescence in these nanotubes has been explained by either carrier injection or impact excitation.

[1]D. Mann et al., submitted for publication (2006).

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