

Abstract Submitted
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Anomalous Electromechanical Resonance Behavior of Single-walled Carbon Nanotubes under High Bias Voltages MEHMET AYKOL, WILLIAM BRANHAM, ZUWEI LIU, MOH AMER, I-KAI HSU, ROHAN DHALL, SHUN-WEN CHANG, STEPHEN CRONIN, University of Southern California — By monitoring the nanoelectromechanical response of suspended individual carbon nanotubes (CNT), we observe the onset of optical phonon (OP) emission in these CNTs under high bias voltages. An abrupt upshift in the mechanical resonance frequency is observed at high voltage biases. The underlying cause of this behavior is the sudden increase in the lattice temperature of the CNT that causes contraction of the lattice due to the negative thermal expansion coefficient. This, in turn, results in increased tension in the suspended nanotube and an upshift in the mechanical resonance frequency. The sudden increase in temperature is explained by the OP emission in CNT. This effect is also observed in the Raman spectra of CNTs as a sudden downshift in the G band OP frequencies at high bias voltages.

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