Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

High Temperature Conductivity and Reactivity of Carbon Nanotube Electronic Circuits[1] A. KANE, PHILIP G. COLLINS, University of California at Irvine — At sufficiently high temperatures, carbon nanotubes (CNTs) begin to react with their immediate environment. For example, adsorbates first desorb, then the carbon may react with connective electrodes, and ultimately Stone-Wales defects become mobile and can be annealed. These reactions are conventionally studied by thermogravimetric analysis (TGA), but they can also profoundly effect the conductance of the nanotubes. We have measured the four probe impedance and transimpedance of individual metallic and semiconducting nanotube devices from room temperature to 1200 K in ultra-high vacuum. When the nanotubes are initially heated from room temperature, the conductance increases as adsorbates are desorbed. On subsequent heating, the device resistance is linearly dependant on temperature over the range 300 to 900 K. Above 900 K the temperature dependence becomes more complex as chemical reactions change the nanotube and as optical phonon modes become thermally populated. This electronic characterization agrees with and complements TGA of bulk, purified CNTs.

[1]NSF grant DMR-0239842

A. Kane
UCI

Date submitted: 10 Jan 2006 Electronic form version 1.4