Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Resonance Raman Study of Linear Carbon Chains Formed by the Heat Treatment of Double-Wall Carbon Nanotubes C. FANTINI, UFMG, Brazil, E. CRUZ, IPICYT, Mexico, A. JORIO, UFMG, Brazil, M. TERRONES, H. TERRONES, IPICYT, Mexico, G. VAN LIER, J-C. CHARLIER, Un. Cath. de Louvain, Belgium, M. S. DRESSELHAUS, MIT, USA, R. SAITO, Tohoku Un., Japan, Y. A. KIM, T. HAYASHI, M. MARAMATSU, M. ENDO, Shinshu Un., Japan, M. A. PIMENTA, UFMG, Brazil — The Raman spectra of carbon nanotubes exhibit weak features in the spectral range between 1600 and 2000 cm^{-1} that are ascribed to a second-order Raman process. However, the observation of unusual and strong spectral features around 1850 cm^{-1} have been reported recently in the Raman spectra of carbon nanotube systems, and have been ascribed to the vibration of one-dimensional chains of carbon atoms. We study the resonance behavior of the unusual Raman feature known as the coalescence-inducing mode (CIM), observed at $\sim$1850 cm^{-1}, in samples of double-wall carbon nanotubes annealed at high temperatures. Resonance Raman spectra taken with many different laser energies show that the intensity of the CIM band exhibits a maximum around 2.20 eV. By comparing the experimental results with first principles calculations for the vibrational frequency and the energy gap, we propose that the CIM feature is associated with short carbon chains with an odd number of atoms, interconnecting the nanotube surfaces.

Cristiano Fantini
UFMG

Date submitted: 12 Jan 2006 Electronic form version 1.4