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Raman Studies on Chirality Purified Nanotubes: the Chirality Dependence of the G Modes in Semiconducting and Metallic Carbon Nanotubes HAGEN TELG, JUAN G. DUQUE, Center for Integrated Nanotechnologies, Los Alamos National Laboratory, XIAOMIN TU, Polymers Division, National Institute of Standards and Technology, ERIK H. HAROZ, JUNICHIRO KONO, Department of Electrical and Computer Engineering, Rice University, MING ZHENG, Polymers Division, National Institute of Standards and Technology, STEPHEN K. DOORN, Center for Integrated Nanotechnologies, Los Alamos National Laboratory — We present results from resonant Raman experiments on nanotube samples which are highly enriched in particular chiralities (n,m). Our study includes 14 different semiconducting tube species and 5 different types of metallic armchair (n,n) carbon nanotubes. Results from G peak positions of semiconducting tubes show a significant dependence on tube diameter, chiral angle and family. Considering theoretical predictions we discuss the origin of these dependences with respect to rehybridization of the carbon orbitals, confinement, and electron-electron interactions.[1] As all armchair nanotubes have the same chiral angle and family, results from these samples are restricted to a diameter dependence, which, however, strongly deviates from the diameter dependence of semiconducting tubes. This deviation has been predicted to be associated with non-adiabatic effects and the Kohn-anomaly in metallic carbon nanotubes. We discuss the contribution of these effects on the peak positions of armchair carbon nanotubes based on electro-chemical doping experiments.

[1]H. Telg et al., ACS Nano 6, 904 (2012)

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