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Raman Studies of Exciton-Phonon Coupling in Single-Walled Carbon Nanotubes STEPHEN DOORN, Los Alamos National Lab, SERGUEI GOUPALOV, SATISHKUMAR CHIKKANNANAVAR — Significant chirality-dependent effects on nanotube Raman intensities have recently been observed whose origins lie in the chirality dependence of exciton-phonon coupling. We present resonance Raman excitation data that demonstrates this dependence in radial breathing mode (RBM) intensities for both E11 and E22 excitation. For E22 excitation, intensities for (n- m)mod 3 = -1 chiralities are significantly more intense than for (n-m)mod 3 = +1, with more complex behavior in E11 excitation. We discuss the results in terms of a new theoretical analysis of exciton-phonon coupling that accurately describes the observations with simple intuitive analytical expressions. Relative intensities can be easily predicted using a newly introduced parameter that is also able to explain a number of anomalies in the observations. We also present the first direct comparison of E11 vs. E22 intensities for a number of chiralities. This comparison yields the ratio of the decay rates for the excited and ground excitonic states serving as intermediate states in the Raman process under E22 and E11 excitations, respectively.

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