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The role of electron-phonon interactions and external strain on the electronic properties of semiconducting carbon nanotubes DENIS KARAISKAJ, ANGELO MASCARENHAS, Center for Basic Science, National Renewable Energy Laboratory — The electron-phonon interactions play an important role in the temperature dependent photoluminescence of semiconducting carbon nanotubes. The energy shifts and spectral narrowing of the excitonic transitions can both be attributed to the electron-phonon interaction. The thermal broadening was fitted by a theoretical expression previously used to model the thermal broadening of critical points in conventional semiconductors. Moreover, careful studies of the energy shifts induced by the external strain had revealed a (n-m) family behavior. We further conclude that using a mathematical expression that combines the theory of semiconducting carbon nanotubes under hydrostatic pressure and strain, this family behavior observed experimentally could be theoretically reproduced, providing new tools to model and predict the effect of strain on the electronic properties of carbon nanotubes. The temperature dependence of the photoluminescence decay of excitons in single walled carbon nanotubes was measured for two nanotube species, (7,6) and (7,5), representative of the two nanotube (n-m)mod3 families. The effect of temperature and external strain on the photoluminescence lifetime will be discussed.

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