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Strain Tuning of the Photocurrent Spectrum in Single wall Carbon Nanotubes[1] PRASANTH GOPINATH, A. MOHITE, H. SHAH, J. LIN, B. NAGABHIRAVA, T. BANSAL, B. ALPHENAAR, University of Louisville — The electronic structure of a single-wall nanotube (SWNT) can be substantially modified by the application of uniaxial strain. We use displacement photocurrent spectroscopy to study the effect of uniaxial strain on the optical transitions of a SWNT in the energy range 0.5eV-3eV. This broad energy range allows us to compare the strain dependence of the lowest (E11) and higher order (E22 and E33) optical transitions of semiconducting SWNT's. As predicted by a simple non-interacting model, we observe an energy shift of each transition with increasing strain. By fitting the model to the magnitude and slope of the energy shift for the lowest energy transition (E11) the nanotube chirality can be identified uniquely. For the higher energy transitions, the data deviates significantly from the non-interacting model, presumably because of the influence of the excitonic binding energy. Finally, we observe a large reversible increase in the magnitude of the photocurrent around the ground state (E11) energy regime with an applied strain of 0.01%. We attribute this to reversible strain induced defect states opening up within the bandgap of the SWNT.

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