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Gate Voltage Dependent Raman Scattering from Semiconducting Carbon Nanotube FETs JAMES TSANG, MARCUS FREITAG, VASILI PEREBEINOS, PHAEDON AVOURIS, IBM T. J. Watson Research Center —
The Raman spectrum of the carbon nanotube in a carbon nanotube FET changes reversibly as a gate voltage is applied, modifying the charge density in the channel. We show that the intensity of the G-line Raman scattering from semiconducting CNTFETs can decrease with applied gate voltage. This is in addition to our previously reported shift of the G-line to higher energies with no change in spectral width as the channel charge density increases. The spectral shift been explained by gate voltage induced changes in the electronic excitations of the carbon nanotube which interact with the G-line. The gate voltage induced G-line shift and intensity changes observed in CNTFETs are similar to the changes observed for the G-line scattering between a suspended carbon nanotube over a trench, and the same tube on the substrate, where the G-line scattering from tube on the substrate shifts to higher energies and is weaker than the G-line scattering from the suspended tube. Gate voltage or substrate induced doping effects can modify the measured intensity of the Raman spectrum of a semiconducting carbon nanotube.

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