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Electrical generation and absorption of phonons in carbon nanotubes B.J. LEROY, S.G. LEMAY, V. PAHILWANI, J. KONG, I. HELLER, C. DEKKER, Delft University of Technology — We have performed low temperature scanning tunneling spectroscopy on individual single-wall carbon nanotubes freely suspended over trenches. Spatially resolved spectroscopy shows a Coulomb-staircase behavior superimposed on the local density of states. In addition to the Coulomb peaks from the addition of electrons, side peaks appear due to phonon-assisted tunneling. Electrons inelastically tunneling into the nanotube cause a non-equilibrium phonon occupation, leading to both emission and absorption of phonons by successive tunneling electrons. The addition of a gate electrode into our STM configuration allows further validation of this interpretation. These observations represent a new class of electrical transport phenomena, namely a current induced non-equilibrium phonon distribution and its influence on transport through a molecule.

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