CARBON NANOTUBE NANOELECTRONIC DEVICES

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Single-wall carbon nanotubes and nanotube-derived hybrid nanoscopic materials are exceptionally promising molecular circuitry components. I will discuss experiments that explore the basic physics and device capabilities of nanotube-based transistors, diodes, interconnects, and memory cells, all of which function at room temperature. Ambipolar nanotube transistors have been created with exceptionally large transconductance. These transistors can also function as single molecule memory cells that are stable for days at room temperature. Individual metallic nanotubes carry currents at densities as large as 10^9 A/cm^2, 100 times larger than conventional interconnects. Scanning gate microscopy is used to image Schottky barriers that form at the interface between a nanotube and a metallic electrode, and to electrostatically manipulate the barrier to controllably create a nanotube molecular diode. Finally, I will present preliminary transport data on circuits consisting of individual nanotube "peapods" consisting of a linear chain of C_{60} molecules enclosed in a single-wall carbon nanotube.