Andreas Hüttel, Nano-electromechanics of carbon nanotubes - coupling single electron effects and mechanical motion (7 Oct)

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ABSTRACT

Carbon nanotubes are not just great electronic conductors. They are very light, with an extreme tensile strength. By now, nanotubes are used in many technological applications, ranging from bullet proof vests to surfboards or bike frames. Here, we will talk about the mechanical properties of single such molecules. The lowermost mechanical vibration modes are the transversal (or bending) mode, where the nanotube vibrates as we know it from a violin or piano string, and the longitudinal (or stretching) mode, where the spatial deflection takes place along the axis of the nanotube. The longitudinal mode is at low temperatures observed in single electron tunneling as a fully quantized harmonic oscillator. The transversal mode, with a much lower frequency, so far shows up in quasi-classical beam mechanics experiments, but also shows fascinating interactions between single electron effects and mechanical motion.