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Nanomechanical energy transfer in carbon nanotubes: fundamental insights from molecular dynamics simulations GIOVANNA LANI, Politecnico of Torino, Torino, Italy and Center for Integrated Nanomechanical Systems (COINS), University of California, Berkeley., P. ALEX GREANEY, COINS, University of California, Berkeley, GIANCARLO CICERO, Politecnico of Torino, Torino, Italy, JEFFREY C. GROSSMAN, COINS, University of California, Berkeley — Single wall carbon nanotubes have been employed as oscillating elements in nanoeletromechanical resonators (NEMS), attaining very high frequencies but disappointingly low quality factors. Despite the amount of work regarding internal friction, intrinsic dissipation within such nanoscale systems is still poorly understood. In this work we employ molecular dynamics simulations to gain insight into how energy is dissipated in a plucked CNT. It is found that dissipation exhibits two regimes depending on the background temperature. At high temperature, the energy decay is exponential, resembling the behavior of a classical damped oscillator, while at low temperatures an initial transient region is observed during which there is little damping. Increasing the duration of this transient region could be a route for engineering higher Q factors NEMS resonators.

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