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Velocity dependence of friction during relative sliding motion of finite concentric carbon nanotubes PAUL TANGNEY, The Molecular Foundry, Lawrence Berkeley National Laboratory, Berkeley CA 94720, STEPHEN B. FAHY, Tyndall National Institute and Department of Physics, University College Cork, Ireland., MARVIN L. COHEN, Department of Physics, University of California at Berkeley, Berkeley CA 94720, STEVEN G. LOUIE, The Molecular Foundry, Lawrence Berkeley National Laboratory and Department of Physics, University of California at Berkeley, Berkeley CA 94720 — Carbon nanotubes are promising candidate materials for use in the construction of nanoscale mechanical devices. Indeed, some prototype mechanical elements such as linear and rotational bearings have already been realized experimentally. A crucial question for the ultimate functionalization of these devices is the efficiency with which they can operate. In this work the effects of friction on pristine nanotube-based mechanical devices are examined. Molecular dynamics simulations are used to study the rate and mechanism of dissipation of mechanical energy during relative motion (along the tube axis) of both capped and uncapped nanotubes moving inside a larger concentric carbon nanotube. A strong and complex dependence of dynamic friction on velocity is observed. Some unique features of friction in nanoscale devices are pointed out and it is shown how these features may be related to the observed behaviour. This work was supported by the Director, Office of Science, Office of Basic Energy Sciences, Division of Materials Sciences and Engineering, of the U.S. Department of Energy under Contract No. DE-AC03-76SF00098.

Paul Tangney
The Molecular Foundry, Lawrence Berkeley National Laboratory
Berkeley CA 94720

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