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Title: Experimental and analytical study of frictional anisotropy of nanotubes[1] ELISA RIEDO, YANG GAO, TAI-DE LI, CUNY Advanced Science Research Center, HSIANG-CHIH CHIU, National Taiwan Normal University, SUENNE KIM, Hanyang University, CHRISTIAN KLINKE, University of Hamburg, ERIO TOSATTI, International School for Advanced Studies (SISSA), and CNR-IOM Democritos and International Centre for Theoretical Physics (ICTP) — The frictional properties of Carbon and Boron Nitride nanotubes (NTs) are very important in a variety of applications, including composite materials, carbon fibers, and micro/nano-electromechanical systems. Atomic force microscopy (AFM) is a powerful tool to investigate with nanoscale resolution the frictional properties of individual NTs. Here, we report on an experimental study of the frictional properties of different types of supported nanotubes by AFM. We also propose a quantitative model to describe and then predict the frictional properties of nanotubes sliding on a substrate along (longitudinal friction) or perpendicular (transverse friction) their axis. This model provides a simple but general analytical relationship that well describes the acquired experimental data. As an example of potential applications, this experimental method combined with the proposed model can guide to design better NTs-ceramic composites, or to self-assemble the nanotubes on a surface in a given direction.

[1]M. Lucas et al., Nature Materials 8, 876-881 (2009)

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