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Radial Elasticity and Friction Properties of Multiwalled Boron Nitride Nanotubes Investigated by Atomic Force Microscopy HSIANG-CHIH CHIU, ELISA RIEDO, School of Physics, Georgia Institute of Technology — Boron Nitride nanotube (BNNT), similar to Carbon nanotube (CNT), has a layered structure with alternating boron and nitride atoms in a honeycomb configuration. BNNTs have comparable mechanical properties with CNTs and are expected to have potential applications in Nano-Electro-Mechanical Systems (NEMS) and nanocomposites. Therefore, understanding their mechanical and frictional properties is crucial to the development of these novel applications. In this work, we study the radial elasticity and friction properties of multiwalled BNNTs by means of Atomic Force Microscopy (AFM). We find that the radial modulus of BNNT decreases nonlinearly with the inverse of its external radius,$R_{\rm ext}$, until arriving at the transverse elastic modulus of bulk hexagonal BN for larger $R_{\rm ext}$ and number of layers.[1] In addition, by sliding an AFM tip across (transverse sliding) and along (longitudinal sliding) the principal axis of the BNNT, we find a larger friction coefficient during the transverse sliding due to the transverse deformation of BNNT. The friction anisotropy, defined as the ratio of the transverse to the longitudinal friction forces per unit area, is found to increase with the nanotube-substrate contact area, estimated to be proportional to $(L_{\rm NT}R_{\rm ext})^{1/2}$, where $L_{\rm NT}$ is the length of the nanotube.[2] Our results provide a better understanding of the mechanical and frictional properties of BNNTs. [1] Appl. Phys. Lett. 101, 103109 (2012) [2] Nanotech. 23, 455706 (2012)

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