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Nanomechanical properties of carbon nanotubes determined using a scanning laser vibrometer LAURA BIEDERMANN, RYAN TUNG, ARVIND RAMAN, RONALD REIFENBERGER, Birck Nanotechnology Center, Purdue University — To better understand the nanomechanical properties of nanotubes and nanowires, reliable nondestructive techniques that measure their Young's modulus, E , under ambient conditions are needed. Using a scanning laser vibrometer, the thermally excited eigenfrequencies of plasma-enhanced carbon vapor deposition (PECVD) multiwalled carbon nanotubes (MWNTs) were measured. Due to the small diameters involved, little light is reflected from a bare MWNT. By carefully attaching a small Au-coated glass bead, the intensity of reflected light is sufficiently increased to allow accurate measurements. The length and diameters of the MWNTs are determined using electron microscopy, allowing E to be inferred from an Euler-Bernoulli analysis of a pinned cantilever beam. A unique aspect of our work is that the attached glass bead exerts a torque on the MWNT. A resonance, attributed to a torsional oscillation, appears for the laden MWNTs, allowing an estimate for the torsional modulus G . Values measured for E and G , along with a description of the experimental procedure, will be presented at the talk.

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