

Abstract Submitted
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Carbon nanotube based NEMS actuators and sensors MICHAEL FORNEY, UNC Charlotte, JORDAN POLER — Single-walled carbon nanotubes (SWNTs) have been widely studied due to superior mechanical and electrical properties. We have grown vertically aligned SWNTs (VA-SWNTs) onto microcantilever (MC) arrays, which provides an architecture for novel actuators and sensors. Raman spectroscopy confirms that the CVD-grown nanotubes are SWNTs and SEM confirms aligned growth. As an actuator, this hybrid MC/VA-SWNT system can be electrostatically modulated. SWNTs are excellent electron acceptors, so we can charge up the VA-SWNT array by applying a voltage. The electrostatic repulsion among the charged SWNTs provides a surface stress that induces MC deflection. Simulation results show that a few electrons per SWNT are needed for measureable deflections, and experimental actuators are being characterized by SEM, Raman, and an AFM optical lever system. The applied voltage is sinusoidally modulated, and deflection is measured with a lock-in amplifier. These actuators could be used for nano-manipulation, release of drugs from a capsule, or nano-valves. As a sensor, this MC/VA-SWNT system offers an improved sensitivity for chemical and bio-sensing compared to surface functionalized MC-based sensors. Those sensors only have a 2D sensing surface, but a MC/VA-SWNT system has significantly more sensing surface because the VA-SWNTs extend microns off the MC surface.

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