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Carbon Nanotube-Based Capillary Rheometer NEAL SCRUGGS, JOSEPH ROBERTSON, JOHN KASIANOWICZ, KALMAN MIGLER, National Institute of Standards and Technology — Nanofluidic devices featuring multi-walled carbon nanotubes (MWNTs) as fluid channels are fabricated for the purpose of measuring the flow of individual, submicron objects (e.g. polymers, nanoparticles) in solution. (Sun, Crooks J. Am. Chem. Soc. 122, 12340, 2000) The MWNTs serve as conduits between two electrolyte reservoirs and the passage of an analyte through the structure is detected by a decrease in the ionic conductance. Initial prototypes employ MWNTs with approximate inner diameters and lengths of 40 nm and 1 micron, respectively. However, because the devices are constructed using simple and generalizable processes, these geometric parameters can be easily varied. Such a device containing a single MWNT could be used to advance fundamental understanding of complex fluid rheology at the nanometer length scale and also function as a sensitive single-object characterization tool for nanoparticles and polymers.

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