Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Hydrodynamic Behavior of Colloidal Nanorods and Characterization of Length Distributions CARLOS SILVERA BATISTA, CONSTANTINE KHRIPIN, XIAOMIN TU, MING ZHENG, JEFFREY FAGAN, National Institute of Standards and Technology — Single-walled carbon nanotubes (SWCNTs) are 1D, cylindrical, structures of carbon with long persistence lengths and consistent diameters. In this talk, I will discuss the use of doubly sorted SWCNTs (by buoyancy and length), which are effectively colloidal rods, to explore experimentally the effectiveness of theoretical approximations for the hydrodynamic drag of a freely rotating rod. The objective of this work is to establish and validate the use of Analytical Ultracentrifugation (AUC) as a technique to measure the length distribution of rodlike colloidal particles including SWCNT dispersions. This is particularly necessary for applications of nanotube dispersions, as the transport, optical, and thermal properties, as well as the toxicity of SWCNTs have all been demonstrated to depend on the length. Contrary to AFM, the technique most commonly used to measure length distributions, AUC is able to measure the whole population of particles as they exist in liquid phase. I will present measurements and analysis of SWCNT samples with narrow distributions in length, diameter and buoyancy as measured through AUC and compare them against independent measurements conducted with AFM. Using this data, the validity of hydrodynamic theory for this application is verified.

Carlos Silvera Batista
National Institute of Standards and Technology

Date submitted: 07 Nov 2012 Electronic form version 1.4