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Fluorescence Correlation Spectroscopy of Single-wall Carbon Nanotubes DENIS PRISTINSKI, VIVEK M. PRABHU, JEFFREY A. FAGAN, National Institute of Standards and Technology — We demonstrate the application of fluorescence correlation spectroscopy (FCS) for the characterization of semiconductor type single-wall carbon nanotubes (SWCNT) in aqueous solution at low concentrations. The technique relies on the intrinsic nanotube bandgap luminescence in the near infrared (NIR) range and does not require nanotube functionalization. The nanotubes used in this study have been dispersed in solution of sodium deoxycholate and length fractionated via centrifugation in an iodixanol density gradient. The (6,5) type nanotubes were resonantly excited by focusing a circularly-polarized 568 nm laser beam into a diffraction limited spot in solution and the luminescence intensity fluctuations were detected at wavelengths above 950 nm using a custom FCS setup with enhanced NIR transmission optics. Correlation functions were analyzed using a model of segmental dynamics of weakly bending rods, modified to account for an additional fast relaxation mode associated with nanotube rotational dynamics and its polarization dependent luminescence. The accessible sample concentration range and the optimum excitation power range were identified. Sample luminescent signal stability significantly exceeding a typical measurement time of few minutes was demonstrated.

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