Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Alignment and Alignment Modulation of Single Wall Carbon Nanotubes Using Lyotropic Chromonic Liquid Crystals M. F. ISLAM, Department of Chemical Engineering and Department of Materials Science & Engineering, Carnegie Mellon University, Pittsburgh, PA 15213, I. I. SMALYUKH, O. D. LAVRENTOVICH, Chemical Physics Interdisciplinary Program and Liquid Crystal Institute, Kent State University, Kent, Ohio 44242, A. G. YODH, Department of Physics & Astronomy, University of Pennsylvania, Philadelphia, PA 19104-6396
— We report alignment and local alignment modulation of single wall carbon nanotubes (SWNTs) dispersed in a nematic solvent of lyotropic chromonic liquid crystals (LCLCs). Polarized optical absorption suggests that when SWNTs are coated with surfactant molecules, e.g., sodium dodecyl benzene sulfonate (NaDDBS), the SWNTs align along the nematic director of the LCLCs, possibly due to elastic interaction between the anisotropic SWNTs and the nematic field of the LCLCs. In contrast, if the SWNTs are not coated with surfactant, then SWNTs align normal to the LCLC nematic director, possibly due to $\pi - \pi$ interactions between the aromatic groups of the LCLCs and the graphitic surface of SWNTs. We describe these observations and show that SWNTs can easily be realigned via realignment of nematic LCLCs using a magnetic field of only a few KGauss. This work is supported by grants from NSF (MRSEC DMR 05-20020 and DMR-0505048) and NASA NAG8-2172.

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Date submitted: 30 Nov 2005 Electronic form version 1.4