Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Cracks and Topological Defects in Nematic Nanotube Gels A.G. YODH, M.F. ISLAM[1], A.M. ALSAYED, Z. DOGIC, M. NOBILI, J. ZHANG, FANGFU YE, T.C. LUBENSKY, Department of Physics & Astronomy, University of Pennsylvania — We have created [1] and studied [2] lyotropic nematic gels composed of aligned single wall carbon nanotubes (SWNTs) in a crosslinked N-isopropyl acrylamide (NIPA) polymer matrix. These composites are created by dispersing surfactant stabilized SWNTs at low concentration in a solution of NIPA monomer that is then polymerized and crosslinked to form a gel, and then inducing a temperature-dependent volume-compression transition of the NIPA gel. Quantitative measurements of SWNT order parameter reveal a concentration-dependent crossover from isotropic to nematic phases. Due to the coupling of nematic order and elasticity of the polymer matrix, we also observe: (i) undulations and then cusping of the gel sidewalls, (ii) a nematic director that evolves as the gel sidewalls deform, (iii) networks of surface cracks that are orthogonal to the nematic director, and (iv) fissures at the sidewall cusps and associated topological defects that would not form in liquid nematics. This work is supported by grants from NSF (MRSEC DMR 05-20020 and DMR-0505048) and NASA NAG8-2172. References: 1. Islam, Alsayed, Dogic, Zhang, Lubensky, Yodh, PRL **92**, 088303 (2004). 2. Islam, Nobili, Ye, Lubensky, Yodh, PRL **95**, 148301 (2005).

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Date submitted: 04 Dec 2005 Electronic form version 1.4