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Viscoelasticity of Networks of Wormlike Micelles with Encapsulated Single Wall Carbon Nanotubes M.F. ISLAM, L.A. HOUGH, A.M. ALSAYED, A.G. YODH, Department of Physics and Astronomy, University of Pennsylvania, Philadelphia, PA 19104-6396 — We investigate the viscoelastic properties of networks of wormlike micelles formed from the surfactant cetyltrimethylammonium tosilate (CTAT) with encapsulated single wall carbon nanotubes (SWNTs). In these experiments we hold the concentration of CTAT fixed at 4 wt%, and then vary the concentration of SWNTs from 0.1 wt% to 0.4 wt%. The rheological measurements of these networks exhibit several striking features: 1) We observe a 10 fold increase of the elastic plateau modulus with the addition of 0.4 wt% of SWNTs. 2) The low shear viscosity increases abruptly ($\sim$10 fold) when the number density of bare SWNTs exceeds the number density of CTAT crosslinks. 3) The addition of SWNTs increases the extensional properties of the CTAT wormlike micelles, allowing fibers to be drawn from the CTAT-SWNT suspension that are stable for several minutes. We consider these observations in the context of flexible and semiflexible/rigid rod polymers. This work has been partially supported by the NSF through MRSEC Grants DMR 00-79909 and DMR-0203378, and by NASA Grant NAG8-2172.

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