587h Dynamics of Nanoparticles in an Entangled Wormlike Micellar Network

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Investigating particle motion within a viscoelastic network is of industrial interest in areas including personal care products, paints, detergents, and food. Here, we investigate the microstructural dynamics of model nanoparticles dispersed in an entangled wormlike micellar mesh. Results investigating phase behavior, rheological investigations, small-angle neutron scattering (both static and under flow), and dynamic and static light scattering are reported. The surfactant concentration can be tuned to adjust the mesh size of the micellar network while increasing the particle concentration builds a more viscous solution. In one case the zero shear viscosity of a solution of wormlike micelles increases by a factor of three upon the addition of one volume percent of nanoparticles. Other significant effects are observed in the relaxation spectra of the micellar fluid upon addition of particles. Further, the self-assembled surfactant aggregates are observed to strongly influence the short-time particle dynamics. Microstructural models ranging from particles freely moving through the micellar network to particles serving as branch points within the micellar network will be discussed within the context of the results.