Abstract Submitted
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Polymer-Carbon Nanotube Composite Films at the Oil/Water Interface: Assembly and Properties[1] DAVID HOAGLAND, TAO FENG, THOMAS P. RUSSELL, Univ. of Massachusetts Amherst — Efficient carbon nanotube assembly at the oil/water interface was achieved by dissolving cationic polymers in the oil phase and oxidized nanotubes in the water phase, the two components spontaneously forming salt bridges to produce a composite interfacial film of nanoscopic thickness. As seen by pendant drop tensiometry, parameters such as carbon nanotube and polymer concentration, pH, polymer molecular weight, and degree of nanotube oxidation all affect assembly strongly, with measured trends to be described and explained. The frequency-dependent elastic and viscous moduli of films in dilation were characterized by interfacial pendant drop rheology. Structural (fast, minutes) and adsorption/desorption (slow, tens of minutes) relaxations were both noted, and at frequencies intermediate to the two, almost insensitive to assembly parameters, the films displayed expected behaviors for 2D critical gels, i.e., at the crossover between fluid and solid. Tan(delta) was frequency-independent over one to two decades of frequency, and the modulus of linear stress relaxation was a power law in time. Films wrinkled by larger (nonlinear) strains recovered over the structural relaxation time.

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