

Abstract Submitted
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Driven Assembly and Properties of Interfacial Polymer-Nanoparticle Composite Layers.¹ DAVID HOAGLAND, THOMAS RUSSELL, TAO FENG, Univ. of Massachusetts Amherst — Specific associations between an oil-soluble polymer and a water-soluble nanoparticle can drive formation of a robust composite polymer-nanoparticle layer at the oil/water interface. Here, for a toluene/water interface, the polymer is oligomeric amine-terminated polystyrene and the nanoparticle is citrate-functionalized gold, with the nanoparticle size varied from 2 to 15 nm. At appropriate pH, the polymer amines and the nanoparticle carboxyls associate strongly by salt-bridging, efficiently segregating both components to the interface and reducing the interfacial tension dramatically. The size of the gold nanoparticles plays a significant role in the process, with smaller nanoparticles better coupling to the polymer, raising the extent to which the surface tension drops. By dilatational interfacial rheology, the composite layers show two relaxations, one by adsorption-desorption and one by polymer configurational rearrangement. For the smaller nanoparticles, the former relaxation disappears, and the interfacial layers are effectively solid-like whereas with the larger nanoparticles, the latter disappears, and the layers are effectively fluid-like. Interesting viscoelasticity is observed in-between.

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