

### **324a The Interactions between Deformable Interfaces: Detailed Experimental Studies Using Afm and Theoretical Modeling on the Nanoscale**

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The control of emulsion properties including shelf life, stability, and coalesce time is a complex problem dependent the interactions between emulsion droplets. Colloidal forces, hydrodynamic interactions and surface deformations contribute to the total interaction between droplets. Measurement and interpretation of these interactions are complicated by interfacail deformation. We employ a novel experimental method (Dagastine, Stevens, Chan, and Grieser *JCIS* (2004)) to study the interaction forces between oil droplets using atomic force microscopy (AFM) and recent theoretical developments (Carnie, Chan, Lewis, Mancia, Dagastine, *Langmuir* (2005)) to quantitatively interpret the experimental measurement between oil droplets in the presence of an anionic surfactant or a tri-block copolymer.

The droplet radii are on the order of 30 to 80 microns, therefore colloidal forces, hydrodynamic interactions and interfacial deformation are all significant components of the total interaction. For the anionic surfactant case, SDS, quantitative agreement between the experimental data and the theoretical predictions is impressive. A series of Pluronic tri-block copolymers were also adsorbed to the oil-water interface where the theoretical description is complicated by drainage through the steric layer. In addition to the study of interfacial forces, the interfacial rheology of these streic layers can also have a significant impact on the droplet interactions in an emulsion system. The interfacial rheological response of these adsorbed Pluronic layers was measured using the pendant drop method to probe the dilatational response. Correlations between the droplet interactions and the interfacial rheological response will also be discussed. These results help provide a significant step forward in the understanding of the nature of the interactions between moving deformable surfaces at the nanoscale that arise from colloidal and hydrodynamic forces.