Interfacial Rheological Mechanics of a Non-ionic, Tri-block Copolymer at Water/Hexadecane Interface

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Growing interest on the stability of foams and emulsions has lead to concentrated research of interfacial rheology. The response of an interfacial layer to mechanical deformation in size and shape is dependent on its composition. [Miller 2010] This research analysis focused on the adsorption and rheological mechanics of the non-ionic, tri-block copolymer, Pluronic 17R4 at the water/hexadecane interface. The adsorption and viscoelastic properties of the interface were measured via methods of pendant drop tensiometry and dynamic oscillation with drop shape analysis software. Interfacial tension measurements were taken to study the surface pressures of Pluronic 17R4 solutions with concentrations ranging from $1x10^{-6}$ M to $1x10^{-2}$ M. Dynamic oscillation experiments were conducted to study the elastic and viscous responses of the Pluronic 17R4 solutions subjected to a series of sinusoidal area deformations at frequencies ranging from 0.01 Hz to 1 Hz. Experimental analysis showed that as concentration and deformation rates increase, the elastic response of the interfacial layer decreases and the viscous response increases. This implies that at higher concentrations and deformation rates, the interfacial layer is behaving more like a viscous film than an elastic solid.