

Synergistic effects of surface viscoelasticity and inter-particle attraction on foam and emulsion rheology

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ABSTRACT

We studied the effects of interfacial viscoelasticity and bubble-bubble (or drop-drop) interactions on the rheological properties of foams and concentrated emulsions [1-3]. The interfacial viscoelasticity was varied in a very wide range either using appropriate co-surfactants or using a series of saponins (natural surfactants) as foam and emulsion stabilizers. To control the bubble-bubble and drop-drop interactions either cationic polymers were added to foams stabilized by anionic surfactants or specific saponin extracts were used. The obtained results for the foam and emulsion rheological properties are compared to reference systems in which the interfacial viscoelasticity is low and the attraction between the bubbles (or drops for emulsions) is negligible [4-6]. This comparison showed that both the increasing interfacial elasticity and the attraction between the fluid particles (bubbles or drops) could increase up to several times the bulk viscoelasticity of the foams and emulsions. The most important results, however, is that the combined effect of these two factors is synergistic and the viscoelasticity of the respective foam or emulsion could increase by up to two orders of magnitude, when compared to the reference systems. This synergistic effect could be very useful in various applications, as it increases dramatically the overall stability of the respective foams and emulsions.

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