Foams stabilized by mixtures of nanoparticles and oppositely charged surfactants: Relationship between bubble shrinkage and foam coarsening

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We believe that our work makes a significant contribution to understand how interfacial jamming and buckling can result in the stabilization of a foam. For our purpose, we use surfactant-decorated nanoparticles, which become irreversibly adsorbed at the gas/liquid interface. Compression of such a bubble leads first to an increase of the interfacial elasticity, before buckling of the surface is observed. In a collection of bubbles, a foam, gas transfer from smaller to larger bubbles also leads to a compression of the interfaces. If the particles are sufficiently highly packed they can become jammed, leading to solid-like behavior, and any further compression will result in the buckling of the interface, characterized by an undulating surface. Trough controlled experiments at multiple length-scales, starting with single interfaces and solitary bubbles, we are able to make qualitative predictions to the arrest of the coarsening through interfacial jamming and buckling.

[1] A. Maestro, E. Rio, W. Drenckhan, D. Langevin and A. Salonen; under review, Soft Matter, 2014