Small-angle neutron scattering studies of the interfaces in aqueous foams stabilized by surfactants, polymer and their mixtures

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ABSTRACT

Small-angle neutron scattering has been employed to characterise the structure of self-assembling complexes formed by small molecule surfactants, polymeric surfactants and their complexes at the interfaces of the bubbles comprising aqueous foams [1-3]. Collectively, the intensity *vs* wavevector Q data for wet foams show a number of inflexions over the mid Q range (intermediate sizes), superimposed on a pronounced Q^{-4} dependence at low Q (the large size associated with the bubble). In the case of simple surfactants [2], these features were found to be dependent on the surfactant structure (e.g. the polymeric block dimensions [1] or alkyl chain length [2]) but independent of factors such as concentration and foam age/height, and showed some correlation with foam stability. Drained foams showed different yet equally characteristic features, including additional peaks attributed to the formation of classical micellar structures. In the case of polymer/surfactant complexes [3], weak solution interactions reflective of distinct coexisting micellar structures in solution lead to segregated layers at the foam interface, whereas strong solution interactions lead to mixed structures both in bulk solution and the formation of interdigitated layers at the interface. Together, these features suggest the dynamic air-water interface is not as simple as often depicted, indeed the data have been successfully described by a model consisting paracrystalline stacks (multilayer) of adsorbed surfactant layers.

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