Smart foams: Switching reversibly between Ultrastable and Unstable foams

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Background & Objectives
Fatty acids are surfactants of particular interest since they can be extracted from agricultural resources. However, long-chain fatty acids are generally insoluble in water at room temperature. Here, we dispersed the 12-hydroxy stearic acid using ethanolamine or hexanolamine as counter-ions. One obtains self-assembled multilayer tubes. Those tubes melt into micelles at a temperature that depends on the nature of the counter-ion. Together with interfacial studies, one of the aims of this work is to determine if foams can be made from such fatty acid solutions, and what are the properties of these foams. We showed that these foams are ultrastable at room temperature and strongly thermoresponsive.

System: bulk studies

Interfacial studies: Adsorption of tubes at the air/water interface?

Neutron reflectivity

Defining of a model

The data cannot be fitted with monolayer or lamellar phases.

Foam studies: how tubes can stabilize foams?

Characterization of foaming properties at 25°C

Evolution with the temperature

Upon heating, tubes transit to micelles (4 nm in length) and micelles (10 μm in length).

Conclusion

- Ultrastable foams with an optimal foamability are obtained using fatty acids multilamellar tubes.
- Upon heating tubes transit to micelles, leading to very fast foam destabilization and thus to the first foams to exhibit strong and reversible temperature-tuneable stability.

References