

From bubbles to balloons: mechanical self-assembly of soft objects with interface-controlled interactions

Des bulles aux ballons: l'assemblage d'objets mous dont le comportement est dicté par des interfaces

Wiebke DRENCKHAN (CNRS Institut Charles Sadron / Université de Strasbourg)

The mechanical assembly of bubbles or drops in a liquid generates foams or high internal phase emulsions. With increasing packing density, their morphology ranges from neatly packed spherical objects at jamming to space-filling polyhedra. The structural features of these assemblies are entirely dictated by the minimisation of interfacial area (i.e. by capillarity) and obey fairly strict rules which start to be well understood. In order to access a wider variety of morphologies, it is important to find methods to interfere with the mechanical equilibrium of the packing in a controlled manner. This can be done by explicitly tuning the interactions between the bubbles (or drops) away from pure capillarity by adding friction, adhesion and/or interfacial elasticity. I will provide a short state-of-the-art of the subject, showing different methods to tune and characterise the interactions between bubbles (or drops) and how they impact the overall foam (emulsion) morphology in the final equilibrium. Advancing our fundamental understanding of these complex mechanical assemblies will not only help in the description of foams (emulsions) with complex interactions, but also inspire the creation of original, mechanically self-assembled, architected materials and tissues.