

Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Dynamics of soft interfaces in droplet-based microfluidics

QUENTIN BROSSEAU, Brown University, INGMAR POLENZ, Max Planck Institute for dynamics and Self-Organization, JEAN-CHRISTOPHE BARET, CRPP Unniversité de Bordeaux — The numerous applications of microfluidic emulsions (i.e compartmentalisation) rely on both the short and long term stabilization of droplet interfaces. This is achieved mainly via the addition of surfactant or the formation of a rigid capsule. Therefore in order to predict and control the stability of the emulsions, a precise control of the interfaces modified in this way is required. In this talk, I present a microfluidic method for the characterisation of the dynamic properties of complex soft interfaces. Monodisperse droplets with controlled interfaces are produced at a flow focusing junction and deformed in sudden planar expansions. The deformation of the droplets is then analysed at different interface ages, allowing us to follow the dynamics of two processes occurring at the interface. First, the evolution of the interfacial tension, from which we extract the surfactant adsorption kinetics for small time and length scales. Secondly, the in-situ kinetics of a interfacial polymerization reaction permitting us to determine the mechanical properties of the resulting polymer shell and encapsulated droplet.

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Date submitted: 31 Jul 2014

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