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Rheological behavior of a millimetric foam films assembly: Part III shear[1] RAPHAEL PORYLES, ADRIEN BUSSONNIRE, EMMANUEL SCHAUB, ISABELLE CANTAT, Institut de Physique de Rennes, France —
Do you shear the films when you shear a foam?
The high viscosity of foam is usually explained by the confinement of the liquid phase in the thin films, leading to local shear rates much higher than the globally imposed one. We revisit this assumption for millimetric bubbles. In this study, we replicate a simple shear deformation in a soap film assembly. Five films are created on a frame in the shape of a StarWars X-wing, with the four external branches inclined at an angle of 120° from the horizontal central film. These branches can be independently displaced using piezo-motors. By photo-bleaching a dark spot in the central film, and measuring its shape and position, we demonstrate the absence of shear in this film, and we evidence that the dynamic strongly differs from a simple shear. It is localized close to the menisci, and involves complex exchanges of liquid and surfactants between the film and the menisci. By measuring the menisci displacements, combined with an interferometry technique, we obtain the tension of each film. This work allows us to elucidate the stress transmission in this complex assembly of surfactant monolayers, gas bubbles, and confined Newtonian phase and to propose different scenarii for foam shear, depending on the bubble size.

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