

Effect of butanol on the bubble formation hysteresis in flow-

focusing devices



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Abstract

The formation of a microfoam in a flow-focusing device is an important topic in microfluidics. The injection of the gas (N2 in our experiment) and the liquid (water with Tween 20 at 1%w, with or without 7%w of butanol) can either result - depending on the parameters of the injection- in only a liquid flow, in a foam, or in a stream of gas flowing in the middle of the channel [1-2].

We observe an hysteretic behavior when increasing the liquid flow (and so the capillary number) or decreasing it, while maintaining the gas pressure P_{σ} constant : the streamfoam transition and the foam-stream transition occurs at different experimental conditions (see Fig.1 below). We observe that a short alcohol has a destabilizing effect on both the stream and the foam, thus reducing the hysteretic behavior.

2. Hysteresis



1. Experimental setup



Pressure drop evolution when decreasing (blue) or increasing (red) the water flow-rate (indicated by the black arrows). The lines are just guides.

The transition between I (bubbles) and II (stream) is shifted depending on whether the system is initialy in state I or II. Hence, a region of bistability exists.

4. Effect of the butanol



surfactant.

when the stream become 3D, which is not the case with butanol.

REFERENCES : [1] B. Dollet et al., Phys. Rev. Lett. 100 (2008) [2] P. Guillot et al., C. R. Chimie 12 (2009)

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