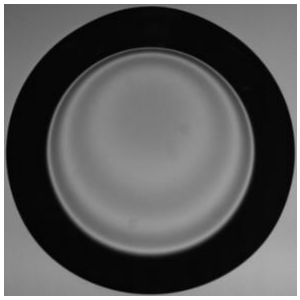
Post-doctoral position at TIPs lab - Université Libre de Bruxelles

STAB-AB - STAbilization of AntiBubbles: Developing stabilisation strategies for antibubbles at macro and micro scales.

Duration: 12 months (+ 24 months optional)
Starting date: January 2024 (flexible).
Keywords: microfluidics, thin film dynamics, film drainage, surface rheology, surfactants, multiphase flow, liquid/gas transfer, evaporation, gas dissolution, emulsification, antibubbles, encapsulation, vesicles, microgravity

Project:



An antibubble is a drop inside a bubble in a liquid. Bubbles and droplets are well-established elementary components in microfluidics, but this project aims at proposing the antibubble as a new elementary component in microfluidics, combining the assets of both bubbles and droplets. The use of antibubble should indeed and ultimately lead to technological breakthroughs such as allowing for unique liquid/gas transfer capabilities and all-aqueous emulsification at high throughput, as targeted in drug micro-encapsulation. However, one of the main limitations of using antibubbles for practical purposes is that it is an ephemeral object, challenging the success of using antibubbles for some applications like in drug release. One must therefore address the crucial point of antibubble stability, the goal of the present research being to investigate several strategies for stabilizing antibubbles. The strategies consist in counteracting the natural drainage of the gas shell or, in other words, the thinning of the bottom of the gas shell. To reach this goal, mechanical, thermal, and physico-chemical means will be investigated. In particular, thermal antibubbles, that consists in inducing the vaporization of the liquid core in order to feed the gas shell, will be explored on ground and in microgravity via parabolic flight campaign scheduled in April 2024. These strategies will be considered on the macro scale (cm) and on the micro scale (100 µm) to obtain a coherent and detail model for the stabilization of the antibubbles.

Transfers, Interfaces and Processes (TIPs) laboratory of the Université libre de Bruxelles (ULB) focuses on experimental characterization and mathematical modelling of transport phenomena within systems containing several phases (gas and/or liquid and/or solid), exchanging matter, heat or momentum, through an interface between these phases, at scales between the micron and the millimetre. The research carried out revolves mainly around fundamental and/or generic questions. They have direct applications in the fields of health, environment, heat transfer technologies and agro-food, chemical, microtechnology, microfluidics, pharmaceuticals, materials, and space industries. More info on TIPs website: https://tips-ulb.be .

In terms of facility, the microfluidic lab at TIPs comprises a technological platform including a clean room for photolithography, a 3D laser writer (Nanoscribe) of submicrometric resolution and a femtoprint device to etch 3D microstructure in glass. These cutting-edge microfabrication equipment have been central in designing nozzles for single and double emulsification, having led to the patented Raydrop technology that is now valorised by Secoya Technologies, a spin-off company of the lab. This technology will be considered to generate antibubbles in microfluidics.

The project will be in close collaboration with the project partner, Stéphane Dorbolo, and his team, at the Université de Liège.

Profile:
Applicants must have completed a Ph.D. in physics, physical or chemical engineering, bioengineering, or similar, with expertise in heat and mass transfer and skills in experimental work. Additional skills in computational fluid mechanics would be appreciated. The successful applicant should have to drive the project and design a microgravity experiment. S/he should be able to work independently as a member of a interdisciplinary team.

Application:
Interested and highly motivated applicant should forward a cover letter stating why the applicant is interested in this position, a complete CV with a publication list and 2 academic referees (with address, phone number and emails).

Contact :
Benoit Scheid (FNRS Research Director)
TIPs lab – ULB C.P. 165/67
50 Av. F. Roosevelt
1050 Bruxelles
BELGIUM
Tel: +32 2 650 48 27
Email: Benoit.Scheid@ulb.be
website: https://bscheid.ulb.ac.be