PhD position at TIPs lab - Université Libre de Bruxelles

CRISTACAPS - Crystallization in capsules: Crystallization in capsules under microfluidic control for the fundamental study of nucleation processes.

Duration: 48 months (Starting from January 2024)
Funding: F.R.S.FNRS – PDR
Keywords: microfluidics, multiphase flow, droplets, mass transfer, emulsification, encapsulation, nucleation, crystallization, soft matter

Project:
The present project aims at using microfluidic batch (in capsules) to study crystallization processes by (de)coupling the nucleation and crystal growth steps through control of seeding. We will develop a microfluidic system for seeded crystallization in capsules of organic molecules for the fundamental understanding of the crystallization process, comparing primary (homogeneous or heterogeneous) and secondary nucleation (in-line nuclei generation). Our systematic investigation of the influence of hydrodynamics on nucleation and crystal growth in an original, high throughput setup using core-shell capsules will help in the fundamental understanding of phenomena involved in crystallization (non-classical theories of nucleation). Model systems under study will be the polymorphs of glycine (as prototype of amino acids) and those of piracetam (prototype of racetams). Results of the crystallization assays will be expressed in terms of crystal yield, crystal morphology, particle size distribution, crystallinity, and characterization of polymorphic form.

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.

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's 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 has been indeed shown to be optimal in generating microcapsules for crystallization, as recently published in Chemical Communications.

The project will be in direct collaboration with the project partner, Professor Johan Wouters, and his team, at the Université de Namur.

Profile:

Application:
Applicants must have completed a Master degree in physics, chemistry, chemical engineering, bioengineering, or similar, with basic knowledge in crystallization and willing to carry both experimental and theoretical works.

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

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