

Postdoctoral fellowship

“Experimental study of microcapsules under hydrodynamic stress”

Laboratory	Biomechanics & Bioengineering (UMR 7338), CNRS – Université de Technologie de Compiègne, CS 60319, 60203 COMPIEGNE, France.
Supervisor	Dr Anne-Virginie SALSAC (a.salsac@utc.fr) web site: http://www.utc.fr/~salsacan/
Collaborators	Dr Rachid JELLALI, Dr Anne LE GOFF, Dr Badr KAOUI, Prof BARTHES-BIESEL
Funding	ERC Consolidator Grant: <i>MultiphysMicroCaps</i> project
Duration	2 years – starting date: any time from June 2021
Salary	25 000€ - 40 000€/year depending on experience
Background	Microfluidics, Biofluids, Biophysics, ...

Context of the post-doctoral fellowship:

MultiphysMicroCaps is a large project that explores the use of deformable liquid-core capsules of micrometric size to efficiently transport active material, with a primary focus on health-related applications. It is focused on the design of innovative sophisticated numerical models and high-tech experiments, needed to determine the potential of such vectors for the protection of active substances, predict membrane breakup to control the delivery, and optimize their properties for specific industrial and biomedical applications.

The postdoctoral fellow will be part of the Biological Fluid-Structure Interactions (BFSI) research team located within the Biomechanics & Bioengineering Laboratory. It is specialized in the study of biofluids and hemodynamics, from the microcirculation scale to the one of blood flows in large vessels, focusing on the fluid-structure interactions that occur with capsule/cell membranes, vessel walls or biomedical devices. It has the unique characteristic of combining advanced numerical and experimental approaches, which enables to translate theoretical results into practical applications, such as the mechanical characterization of microcapsules.

Description of the postdoctoral research project:

Encapsulation consists in enclosing an internal medium in a solid semi-permeable membrane to protect it and control the exchanges with the environment. Capsules offer tremendous potential in the fields of biotechnologies, pharmacology, energy storage and food industry, but scientific challenges remain to be met, such as finding the optimal compromise between payload and membrane thickness, characterizing the membrane resistance and controlling the moment of rupture.

The objective will be to contribute to setting up an experimental platform to identify with precision the mechanical resistance of deformable capsules of diameter ranging from a few tens of microns to a few millimeters. The capsules will be prepared by inducing cross-linking on droplets. The goal will be to characterize how the capsule elastic shear and bending properties affect breakup and to determine the mechanisms governing capsule rupture, which has hardly been explored.

Documents required to apply: We are looking for highly motivated, dynamic and rigorous candidates, who will be fully involved in the project and eager to integrate the interdisciplinary BFSI research team.

Interested candidates should send an application letter along with a full CV, copies of the PhD reports and the reference letters from 2-3 referents.