

PhD fellowship available → starting January 2027

PhD in Numerical & Experimental Fluid Mechanics for Bioprocess Intensification

36-month PhD fellowship at UPPA as part of the MARINEX project

MARINEX (*MARine INtegrated EXtraction*) co-funded by Région Nouvelle Aquitaine

Project description/Duties:

The MARINEX project aims to develop an innovative integrated process for the continuous extraction of bioactive compounds from marine microorganisms through the combination of Pulsed Electric Fields (PEF), green solvents, and enzymatic treatments. The overall objective is to establish a sustainable cascade biorefinery approach for the valorization of marine biomass and the recovery of high-value bioactive compounds with potential applications in various fields, including pharmaceuticals, cosmetics, green chemistry, and agriculture. This PhD project builds upon the outcomes of the ADEME-Graine MiACE-PEF project, conducted at the University of Pau and Pays de l'Adour (UPPA) between 2022 and 2026, which resulted in the development of a continuous PEF pretreatment demonstrator for microalgae processing. The research will focus on optimizing the PEF pretreatment step to control cell permeabilization and improve mass transfer, as well as on the development and use of tailored green solvents for the selective extraction of target compounds. A bio-inspired strategy will be implemented to investigate the sequential coupling of PEF, solvent, and enzymatic treatments in order to maximize extraction yields while preserving the structural integrity and functionality of the extracted molecules. The integrated process will be evaluated through environmental and techno-economic assessments to determine its sustainability and industrial potential. This multidisciplinary PhD project will combine fluid mechanics, process engineering, green chemistry, and innovative biotechnology within the SIAME and IPREM research laboratories at UPPA. The work will be conducted in close collaboration with academic partners, including the University of Zaragoza (Spain), as well as industrial stakeholders.

The position will involve conducting research activities, preparing scientific reports and publications, and participating in meetings with academic and industrial partners and collaborators. The PhD candidate will also be required to attend courses and training programs offered by the Doctoral School of Exact Sciences and Their Applications (ED 211).

Research Group:

Host Labs: the SIAME laboratory at UPPA (Laboratory of Engineering Sciences Applied to Mechanics and Electrical Engineering) and the MANTA team based at IPREM, a joint CNRS/UPPA research unit (UMR 5254).

The work will be mainly carried out within the “Ecoulements et Energétique” Team at the SIAME Laboratory at UPPA in Pau. For more details on the activities of the laboratory's four teams, please visit the laboratory's website: <https://siame.univ-pau.fr/fr/organisation.html>

IPREM has an extensive and highly competitive research program that encompasses fundamental research in physical chemistry, analytical chemistry and microbiology, as related to the molecular structure of the living world, environmental management and the functional properties of different classes of materials.

Institute of Analytical Sciences and Physico-Chemistry for Environment and Materials (IPREM):

<https://iprem.univ-pau.fr/fr/index.html>

MANTA Chair: <https://iprem.univ-pau.fr/fr/collaborations/chaieres/manta/presentation.html>

More information on the UPPA is available in the website: Université de Pau et des Pays de l'Adour (UPPA), Pau, France : <https://www.univ-pau.fr/fr/index.html>

The PhD thesis will be supervised by Yves Le Guer (Associate Professor, SIAME Lab) and Susana Fernandes (Professor, MANTA Chair - IPREM).

Requirements:

- A Master's degree (or equivalent) with a strong background in fluid mechanics and physics, and a genuine interest in applying it to bioprocesses.
- Proficiency in computational fluid dynamics (CFD) tools such as OpenFOAM, and/or ANSYS Fluent, as well as programming languages (e.g., Python) and scientific visualization software (e.g., ParaView).
- Strong programming skills and experience in numerical modeling.
- Hands-on experience with, or strong motivation for, experimental techniques commonly used in fluid mechanics and chemical engineering - the candidate will spend significant time at the bench, not only in front of a screen.
- Knowledge of complex fluid rheology and physical chemistry would be considered an advantage.
- Excellent written and spoken English skills.

The candidate's interpersonal skills will also be considered, with particular emphasis on the ability to work effectively within a multidisciplinary research environment involving electrical engineers, process engineers, and physical chemists.

This is a genuinely hybrid PhD project: **the candidate will move continuously between the lab bench and the computer, using experimental data to build and validate numerical models**, and using those models in turn to guide new experimental campaigns. Experimental activities will include fluid mechanics studies, extraction processes, and physicochemical characterization of bio-based products, while numerical work will involve the development and validation of 3D computational fluid dynamics (CFD) models of the PEF and extraction processes. We are looking for a candidate who enjoys this constant dialogue between simulation and experiment, rather than a purely numerical or purely experimental profile.

Location:

This position will be based in UPPA, Pau with short stays in Zaragoza to collaborate with a Spanish research team of UNIZAR. The experimental component of **the PhD project requires the student to be present at UPPA 100% of the time**.

Application:

Candidates who hold a master's degree in the relevant scientific fields are strongly encouraged to apply before the application deadline. The application package must include:

- a resume,
- a copy of the master's degree certificate and a transcript broken down by course,
- a cover letter (one page, or two pages at most),
- the contact information for two references.

The application must be written in English or in French.

Please submit the required documents by November 22, 2026, to:

Yves Le Guer: yves.leguer@univ-pau.fr and Susana Fernandes : susana.fernandes@univ-pau.fr

The application will be evaluated based on the following criteria:

Appropriate education and work/research experience in related fields. Candidate motivation, knowledge, scientific maturity and curiosity. Emphasis will also be placed on personal skills.

Selection process – Application due to November 22, 2026

1. Evaluation of the candidates' application.
2. If selected, the candidate will have 15 min to present her/his CV and project. The presentation will be followed by questions/discussion.

Net Salary: 1 850 € per month (according to UPPA contract) + plus the possibility of teaching hours.

Starting date: January 2027.

Type of position: Full-time temporary position for 36 months.