

PhD position in Process Safety and Process Simulation of Electrified Chemical Processes M/F

Duration: 3 years (Starting from October-November 2026)

Salary: 2300 € gross/month

Supervisors: Sébastien Leveueur (sebastien.leveneur@ircelyon.univ-lyon1.fr)
& co-supervisor: Naoufel Haddour (naoufel.haddour@ec-lyon.fr)

Location: IRCELYON & Ampère (Lyon)

Keywords: process electrification, cost evaluation, risk assessment, process analysis

💡 Introduction to the e-FixedBed Project

This PhD will be embedded in the [e-FixedBed ANR project](#), which aims to develop a **new generation of electrified catalytic reactors** in which the heat required for chemical reactions is generated directly within the catalytic packed bed via **Joule heating** (Figure 1).

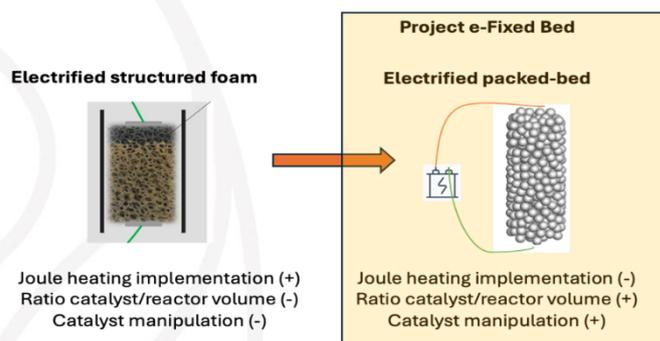


Fig. 1: e-FixedBed concept presentation

The research is conducted within a **multidisciplinary consortium** including:

- CP2M – Lyon (Catalysis and reactor engineering)
- ICPEES – Strasbourg (Catalyst design)
- Ampère – Lyon (Electrical engineering and conductive materials)
- IRCELYON – Lyon (Process safety and process engineering)

Within this project, the **PhD student at LSPC will focus on process safety and process analysis of electrified chemical reactors.**

🎯 Research Objectives of the PhD

The PhD student will contribute to the **safe design and large-scale evaluation of electrified catalytic reactors**. The research will focus on two major areas:

1. Process Safety for Electrified Reactors

The electrification of chemical processes introduces **new safety challenges**, including electrical hazards, thermal hotspots, and interactions between electrical and chemical systems.



The PhD student will:

- Develop **safety procedures for electrified catalytic reactors**
- Perform **risk assessments for electrified chemical processes**
- Study **electrical and thermal risks** in catalytic packed beds

2. Process Simulation and Process Flow Diagrams

The PhD student will also participate in the **process-scale evaluation of the electrified reactor concept**.

This includes:

- Development of **Process Flow Diagrams (PFD)** for electrified processes
- Integration of **renewable electricity, electrolyzers, and fuel cells**
- Techno-economic analysis

The student will perform **multi-criteria assessments**.

Expected Scientific Contributions

The PhD will contribute to:

- Development of **risk analysis methodologies for electrified chemical processes**
- Safe integration of **electric heating in catalytic reactors**
- Design of **electrified process flowsheets**
- Evaluation of the **techno-economic feasibility of electrified reactors**

This work addresses key challenges for the **decarbonization of chemical industry through electrification**.

References

1. Daniele Di Menno Di Bucchianico, Giordano Emrys Scarponi, Jean-Christophe Buvat, Sébastien Leveneur, Valeria Casson-Moreno, Sustainable design of biomass valorization processes for the production of gamma-valerolactone integrating wind energy and green hydrogen, *Journal of Cleaner Production*, Volume 491, 1 February 2025, 144829. <https://doi.org/10.1016/j.jclepro.2025.144829>
2. Daniele Di Menno Di Bucchianico, Giordano Emrys Scarponi, Jean-Christophe Buvat, Sébastien Leveneur, Valeria Casson-Moreno, From biomass-derived fructose to γ -valerolactone: process design and techno-economic assessment, *Bioresource Technology*, 401 (2024) 130753, <https://doi.org/10.1016/j.biortech.2024.130753>
3. Elizabeth Antonia Garcia-Hernandez, Moulay Elhassane Elmoukrie, Sébastien Leveneur, Bouchaib Gourich, Lamiae Vernieres-Hassimi, Global sensitivity analysis to identify influential model input on thermal risk parameters: to cottonseed oil epoxidation, *Journal of loss prevention in the process industries*, Volume 77, July 2022, 104795, DOI <https://doi.org/10.1016/j.jlp.2022.104795>.



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INSTITUT DE RECHERCHES
SUR LA CATALYSE
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Université Claude Bernard



Lyon 1



What you will gain

- Strong expertise in process safety and risk assessment for electrified chemical processes
- Hands-on experience with process simulation and flowsheet development
- Exposure to electrified reactors, Joule heating, and energy-efficient catalytic processes
- Publications in international peer-reviewed journals
- Participation in international conferences and collaborative research projects
- Training in a multidisciplinary environment at the interface of chemical and electrical engineering
- Based in Lyon — widely regarded as the gastronomic capital of France — the position offers both scientific excellence and a vibrant lifestyle.

Requirements:

Education

Master's degree in:

- Chemical Engineering
- Process Engineering
- Industrial Risk / Process Safety
- Energy Engineering

Required Skills

Strong knowledge in at least two of the following areas:

- Process safety / risk analysis
- Process simulation
- Process Flow Diagrams (PFD)
- Chemical reaction engineering
- Energy systems

Experience with the following tools is highly desirable:

- Aspen Plus
- ProSim
- Matlab / Python (optional)

Languages

- Good level of English (written and spoken)

Personal Skills

- Ability to work in multidisciplinary teams
- Interest in energy transition and electrified processes
- Strong analytical and problem-solving skills

How to apply and get further information:

The candidates should send a detailed curriculum vitae, a motivation letter, a transcript of record (Bachelor and Master), and other valuable documents (recommendation letters, language and degree certificates, awards, etc.). **These documents must be sent via the following website** [Portail Emploi CNRS - Job offer - PhD position in Process Safety and Process Simulation of Electrified Chemical Processes M/F](https://emploi.cnrs.fr/Offres/Doctorant/UMR5256-SEBLEV-002/Default.aspx) (https://emploi.cnrs.fr/Offres/Doctorant/UMR5256-SEBLEV-002/Default.aspx)

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The screenshot shows the 'Portail Emploi' page for a PhD position. At the top right, there is a 'Sign in' button. A red arrow points from this button to a list of steps: '1. Create an account' and '2. Apply'. Below the job title, there is a 'Create your alert' box with a yellow 'Create your alert' button. A blue arrow points from this button to the 'Apply' button in the 'Offer at a glance' section. The 'Offer at a glance' section contains the following details:

The Unit Institut de Recherches sur la Catalyse et l'Environnement de Lyon	Workplace 69100 VILLEURBANNE
Contract Type FTC PhD student / Offer for thesis	Contract Duration 36 months
Working hours Full Time	Date of hire 05/10/2026
	Remuneration 2300 € gross monthly

At the bottom of the 'Offer at a glance' section, there is an 'Apply' button and a warning icon with the text 'Application Deadline : 07 April 2026 23:59'.

1. Create an account
2. Apply

Assessment

The candidate assessment is a two-step evaluation. The candidates will be evaluated by a jury of three researchers (including Sébastien Leveneur and Naoufel Haddour).

In the first step, the jury will evaluate the different applications based on the provided documents. The selection of the candidates for the second step (i.e., interview in English) will be done based on the quality of their chemical engineering and chemistry education (courses and marks), their abroad experience in research or other activity, their language skills (mainly English), the relationship between their master thesis and this doctoral thesis, their scientific publication (article and/or communication on congresses), their recommendation letters and the quality of their resume and motivation letter.

In the second step, the selected candidates (from the first step) will pass an interview. This interview can be done online via video conference calls. The interview will last ca. 15 minutes per candidate, during which the candidate will present themselves and describe their research activities. The evaluation will be done based on their presentation, the quality of their responses, and their motivation to do this thesis.