



PhD in Microfluidics/Photochemistry

October-2025 - CEA Paris-Saclay (France)

Sujet (Français) : Développement de photoréacteurs microfluidiques pour l'évaluation reproductible et quantitative de matériaux photoactifs, couplés à l'analyse en ligne par spectrométrie de masse et chromatographie en phase gazeuse

Subject (English): Development of microfluidic photoreactors for reproducible, quantitative evaluation of photoactive materials, coupled with on-line analysis by mass spectrometry and gas chromatography

Domains: Microfluidics / Photoreactor / analytical chemistry/ in-line analysis

Context of the project: The development of high-performance photoactive materials (catalysts, semiconductors, sensitive films) for chemical conversion under light irradiation requires precise, reproducible and quantitative evaluation methods. Conventional batch approaches suffer from major limitations: poor control over residence time, temperature or light gradients, low exposed specific surface area and variable reproducibility. In this context, microfluidic photoreactors offer a promising alternative for structured screening and fine evaluation of photoactive materials, in particular thanks to their high surface/volume ratio, flow control and geometry adaptable to different irradiation configurations.

This work, linked to the PEPR LUMA SUNRISE project, aims to design, fabricate and characterize photonic microreactors specifically adapted to the fine evaluation of photoactive materials. The aim is to create a platform capable of generating quantitative and comparable data on the performance and stability of these materials, under well-defined conditions of throughput, irradiation and reaction environment, and then to couple them to high-level analytical techniques (GC, MS) for on-line identification of the products generated.

The recruited PhD candidate will be in charge of 4 axes during this thesis project: 1) development, characterization and optimization of the microfluidic platform for online liquid and gas measurement; 2) implementation of protocols for the deposition of photoactive materials 3) evaluation of photochemical performance and validation of the system with samples provided (SUNRISE partners) and on the degradation of pollutant by photochemistry (collaboration with a thesis in progress at the laboratory) and 4) Coupling of the reactor to online analytical methods (GC, MS).

The work will be carried out at LIONS of CEA Saclay

Job responsibilities: The selected candidate will:

- Design and fabricate microfluidic devices in clean room and using rapid prototyping tools.
- Set up and optimize photoreactor
- implement in-line analysis measurements coupled to the miniaturized photoreactor.
- Take an active role in the presentation and publication of research results.

Candidate profile: We are looking for outstanding candidates with the following skills:

- A Masters or Engineering degree in microfluidics, engineering science or analytical chemistry
- Real motivation and ability to work in collaboration across disciplines and autonomously
- Fluent English, both spoken and written

Starting date: October 2025

How to apply: Applicants should send their CV+ cover letter + recommendation letters to Florent MALLOGGI (florent.malloggi@cea.fr).