

## PhD position (Oct. 2025)

### Photopolymerization in dispersed media using inorganic particles as Pickering stabilizers and photoinitiators

Laboratory of Catalysis, Polymerization, Processes and Materials  
(CP2M, CNRS, University Claude Bernard Lyon1)

#### Project description

This PhD project aims to **exploit light**—particularly low-energy photons (in the visible or near-infrared range)—to initiate *surfactant-free radical polymerizations* in dispersed media (emulsion, miniemulsion, dispersion, and/or suspension). The originality of the project lies in the use of inorganic nanoparticles (InPs) not only as *solid stabilizers* (Pickering agents), but also as potential *photoinitiators* (PIs). This will enable the formation of **armored latex particles** whose surfaces are covered with inorganic particles, leading to functional materials with enhanced mechanical robustness and specific properties.

Two main types of nanomaterials will be investigated: **cerium oxide ( $\text{CeO}_2$ ) nanoparticles** and **gold nanopyrramids**, selected for their broad photochemical properties and application potential. The strategy involves surface-grafting techniques to grow polymer chains from initiators or comonomers anchored onto the inorganic particles, enabling control over particle morphology.

Two scenarios will be explored:

- 1) No photon–nanoparticle interaction: inorganic compounds act solely as stabilizers.
- 2) Photon–nanoparticle interaction: inorganic compounds serve both as stabilizers and photoinitiators.

In the case of gold nanostructures, their surface plasmon resonance will be exploited to generate a **photothermal effect**, converting light into localized heat under specific irradiation, which promotes polymerization.

**The project will also assess the structure and performance** (mechanical, optical, etc.) **of the resulting hybrid latexes and derivative materials** (e.g., films, porous solids). To date, no existing method allows the formation of hybrid latexes via photoemulsion or photodispersion using dual-function InPs, despite the significant advantages of photochemistry for reactivity control, energy efficiency, and safety.

#### Host laboratory and supervision

This PhD is part of the ANR-funded project "PhotoPick" and will be carried out at the **CP2M laboratory** (Lyon). It combines fundamental and applied research. The candidate will be co-supervised by **Dr. Elodie Bourgeat-Lami** and **Dr. Muriel Lansalot** (CNRS researchers), experts in radical polymerization, hybrid materials synthesis, and colloidal physico-chemistry.

The project includes collaborations with **Dr. Emmanuel Lacôte** (IRCP, Chimie ParisTech), **Prof. Jacques Lalevée's team** (IS2M, Mulhouse) and the **Laboratoire de Chimie** at ENS Lyon.

The PhD student will benefit from a stimulating, interdisciplinary research environment and is expected to participate in short stays at partner laboratories.

### Candidate profile

Applicants should hold a **Master's degree in Chemistry** and/or Materials Science (or equivalent), with strong written and oral communication skills, scientific rigor, motivation, curiosity, and a good team spirit. Experience in **polymer chemistry**, **colloids**, and **polymerization in dispersed media** will be considered an asset.

### Practical details

*Funding:* ANR (PhotoPick project)

*Employer:* Université Claude Bernard Lyon 1 (UCBL)

*Salary:* approx. €2200 gross/month

*Duration:* 3 years

*Start date:* October 1, 2025

### Application

Applications (cover letter, CV and 1–2 recommendation letters) should be sent to: *Elodie Bourgeat-Lami* ([Elodie.bourgeat-lami@univ-lyon1.fr](mailto:Elodie.bourgeat-lami@univ-lyon1.fr)) and *Muriel Lansalot* ([muriel.lansalot@univ-lyon1.fr](mailto:muriel.lansalot@univ-lyon1.fr)).

**CP2M** web site. Research Gate: **E. Bourgeat-Lami, M. Lansalot**