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 (CeO_2) nanoparticles** and **gold nanopyramids**, 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) and *Muriel Lansalot* (muriel.lansalot@univ-lyon1.fr).

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