

Thesis of the University of Toulouse

Doctoral school: *Material Sciences of the University of Toulouse*

Acronyme : **CATonPGA**

Title: Catalysts supported on natural substrates of γ -PGA type: application to the transformation of natural products under green chemistry conditions.

Supervisors:

1. Dominique Agustin (PR CNU 32, LCC-Castres)
2. Tassadit Nait Chabane (MCF CNU 65, LBAE Auch)

Co-financing: University of Toulouse + IUT Toulouse Auch Castres + Syndicat Mixte de la Communauté d'Agglomération Castres Mazamet

The thesis will take place on two sites. The main site is the IUT of Castres (within the LCC team) and one-off missions will be set up on the site of the IUT of Auch. Both places are equipped to carry out the research presented. Some measurements may be carried out in Toulouse if not present at both locations.

Project objectives: New environmentally friendly catalytic strategies for bio-based substrates.

- Development of catalysts for selective oxidation of biomass products under mild conditions, with a significant reduction in the use of organic solvents
- Immobilization and recycling of catalysts on functionalized bio-based polymeric (γ -PGA) supports in order to improve the compatibility between the different components of the reaction.
- Exploration of bio-based polymers: Commercial γ -PGA (high purity, variable size) will serve as proof of concept. γ -PGA produced by bacterial strains (variable purity and size) will be tested
- In the longer term: With efficient systems, transposition into a continuous flow will be attempted to promote recycling of catalytic objects, addition of reagents and modularity of reactivity.

Implementation plan

Task 1: Evaluation of catalysis complexes on biomass compounds (Castres)

Task 2: Development of the model catalyst (Castres)

Task 3: Development of gamma-PGA (Auch)

Task 4: Catalysis with supported catalysts (Castres)

Research teams and supervisors:

LCC: Team G (LAC2) of the Coordination Chemistry Laboratory on 2 sites, the CNRS Campus and the IUT of Castres, specialized in catalysis, biomass valorization and polymer chemistry. **Dominique Agustin** (PR) will bring his expertise in the oxidation of natural products, "mechanistic studies" as well as on the functionalization of supports. Other people from the team will be involved to help with analytics, organic chemistry and continuous flow.

LBAE: Laboratory of Agri-Food and Environmental Biotechnologies is a host team (EA 4565) of the University of Toulouse located in Auch (on the IUT site) specialized in extracellular biopolymers, biofilms and microbial aggregates. **Tassadit Nait Chabane** (MCF Auch) will mobilize its expertise in microbiology and biochemistry to optimize the production/purification of bacterial γ -PGA. Valérie Letisse, an expert in industrial microbiology, will contribute to the production at the bioreactor scale.

If you wish to apply, please send me **QUICKLY** CV , cover letter and grades (for the entire university course). A chemist's background with knowledge of molecular synthesis and characterization is required. Expertise in catalysis, surface functionalization, enzymatic approaches and theoretical DFT calculations is a plus that will be considered. **A video interview will be carried out with the prospective candidates.**

Pour toutes questions, contacter dominique.agustin@iut-tlse3.fr