

PhD position at IFP Energies nouvelles (IFPEN)

Sciences chimiques, Génie chimique

Coupling radical and catalytic plastic cracking : Unveiling mechanisms towards better recyclability

As plastic waste defines the Anthropocene, efforts towards the development of recycling technology are ramping up. For polyolefins (PO), common packaging materials, the available technologies of mechanical recycling and of pyrolysis (thermal conversion) have several drawbacks and can process only a fraction of waste. A promising alternative pathway for PO recycling has been explored in which the PO conversion is enhanced by the presence of H₂S, which promotes thermal cracking. When this is coupled with a well selected heterogeneous catalyst, the products obtained can selectively be optimized towards better recyclability.

The objectives of the research are: first, to elucidate the thermal cracking mechanism of polyolefins in the presence of H₂S and second, to optimize the coupling of the thermal mechanism with a catalytic mechanism by adding a catalyst. The work will be centered on the realization of plastic conversion tests in a dedicated unit, product characterization and interpretation of results. The thus obtained data and insights will be used to build a reaction mechanism and its modeling by adapting existing methodologies.

This research will provide valuable fundamental understanding of the mechanism of polyolefin cracking in presence of H₂S both experimentally and theoretically. This knowledge is absent from the current literature and is essential to the development of an alternative and robust PO recycling technology.

The work will take place at IFPEN, mostly in Solaize with some time spent in Rueil, a research entity with significant experience in the study of complex molecule conversion, catalytic systems, reaction mechanisms and kinetic modeling. The project is developed in collaboration with CP2M laboratory in Villeurbanne specialized in polyolefin synthesis, recycling, and analysis.

Keywords: plastic, recycling, polyolefins, conversion, kinetic modeling, hydrocracking, hydrogen, sulfur

Supervision and organization

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Co-Supervisor	Dr Vincent MONTEIL, CP2M, ORCID: 0000-0003-3530-1789
PhD location	IFPEN, Lyon, France
Duration and start date	3 years, starting in the fourth quarter 2024 (November 4th)
Employer	IFPEN

About IFP Energies nouvelles

IFP Energies nouvelles is a French public-sector research, innovation and training center. Its mission is to develop efficient, economical, clean and sustainable technologies in the fields of energy, transport and the environment. For more information, see [our WEB site](#). IFPEN offers a stimulating research environment, with access to first in class laboratory infrastructures and computing facilities. IFPEN offers competitive salary and benefits packages. All PhD students have access to dedicated seminars and training sessions.

How to apply:

Academic requirements	University Master degree in chemical sciences, chemical engineering
Language requirements	Fluent in English, willingness to learn French
Other requirements	Liking for laboratory work; Knowledge of numerical simulations appreciated; Programming skills appreciated

Your application must include:

- CV
- Cover letter

It will be appreciated if you also include:

- Academic transcript with grades
- Name and contact of two references we might get in touch with

Applications should be sent to ana-teresa.fialho-batista@ifpen.fr. Feel free to contact us for more information on the subject.