

PhD position at IFP Energies nouvelles (IFPEN) *Chemical sciences*

New Horizon in e-biofuels: Breaking the Selectivity Limitation in Hydrogenation of CO₂ into C₂ products

In a global context marked by climate emergency, numerous approaches are emerging to decarbonize transport and industry, either by reducing the use of fossil resources or by promoting a circular carbon economy. This PhD project proposes to investigate an innovative building block in the synthesis scheme of sustainable aviation fuels (SAF), aiming to directly convert a biomass gasification outlet stream composed of CO₂, CO, and H₂ into a platform molecule: ethanol. The catalysts currently reported in the literature for this reaction suffer from limited selectivity due to the complexity of the reactions involved, which generates numerous by-products. In this PhD thesis, we propose to dissociate this poorly selective complex reaction into tandem reactions that are much better controlled through the use of distinct catalysts efficiently arranged within the same reactor. The PhD student will be entrusted with a variety of tasks that will include synthesizing these new materials; testing them in CO₂ hydrogenation experiments; developing an *operando* FTIR approach to study reaction intermediates, active sites and inhibitors on the catalyst surface under reaction conditions; and finally organizing and monitoring test studies on the IFPEN high-throughput experimentation platform, which allows the parallel testing of 16 catalysts. This innovative research project is looking for a motivated, organized, and curious candidate ready to evolve in a great scientific environment at IFPEN and IRCELYON. The PhD student will be half the time at IRCELYON: a world-renowned laboratory in the field of catalysis and half the time at IFPEN: a major French player in research and training. Finally, this PhD project is part of the PEPR e-biofuels 2026-2031 led by APED (Program Agency for Research on Decarbonized Energies).

Keywords: CO₂ Hydrogenation – Syngas Conversion – Heterogeneous Catalysis – Materials synthesis – oxide – zeolite – e-biofuels – FTIR-*Operando*

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IFPEN supervisor	Dr Céline PAGIS, celine.pagis@ifpen.fr , ORCID : 0000-0002-5188-0648
PhD location	IFPEN, Lyon, France (50%) et IRCELYon, Lyon, France (50%)
Duration and start date	3 years, starting in the fourth quarter 2026 (November 2 nd)
Employer	IFPEN
Academic requirements	University Master degree in Chemistry or equivalent
Language requirements	English level B2 (CEFR), willingness to learn French language
Other requirements	Knowledge of materials chemistry and catalysis

To apply, please send your cover letter and CV to the academic and IFPEN supervisors indicated here above.

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.