

Supervisor(s)	Period	Funding
Prof. Mark Saeys Dr. Max Bols	4 years	VLAIO

## Innovative catalysis for CO<sub>2</sub> to CO conversion during propene synthesis. Full-time PhD position, fully funded

### Aim

Development of a retrofittable catalytic solution to decrease the CO<sub>2</sub> intensity of existing propane dehydrogenation through coupled CO<sub>2</sub> to CO conversion

### Context

Propylene is one of the key building blocks for the chemical industry, but divergent evolutions in the industry have given rise to the so-called “propylene gap”. To bridge this gap, on-purpose propylene production has been coming online. However the on-purpose production is energy intensive and comes with large CO<sub>2</sub> emissions. To reduce their CO<sub>2</sub> intensity, a modification to existing plants is proposed that introduces oxidative dehydrogenation of propene coupled to CO<sub>2</sub> conversion to CO through innovative catalysis.

The PhD is funded through an approved Flemish research project that will prioritize the further investigation and development of zeolite supported vanadium oxide catalysts which emerged from preliminary research (see also <https://pubs.acs.org/doi/abs/10.1021/acscatal.2c01374>). The research will primarily be conducted in the research group of prof. Mark Saeys at the laboratory of Chemical Technology (LCT) at the university of Gent. You will focus on figuring out the catalytic reaction mechanisms using, among others, steady-state isotopic-transient kinetic analysis (SSITKA) experiments and various characterization techniques (XRD, XPS, XAS, ss-NMR, operando DRIFTS, Raman, ...). Material synthesis and physical characterization will be delivered by the collaborating group of prof. M. Dusselier of KU Leuven, and microkinetic studies and modelling will be delivered by the collaborating group of prof. J. Thybaut at the LCT. You will work closely with a colleague supporting your research with molecular modelling. The end goal is the collaborative development of a commercially attractive catalyst.

This Ph.D. offers a unique opportunity to dedicate yourself to fundamental research in catalysis in an applied, industrially relevant, and collaborative framework. Your workplace (LCT) is an international environment with intense contacts with industry, and with professionally engineered and operated experimental facilities. the LCT is embedded in the University of Ghent, a world-renowned research university. The M. Saeys research group is focused on catalysis and technologies for CO<sub>2</sub> conversion with expertise in modelling-guided catalyst design coupled to experimental kinetic validation and state-of-the-art characterization.

### Program and job description

- Under the supervision of a professor and a postdoc researcher in the team, you will prepare a PhD dissertation over a duration of about 4 years. In these 4 years you publish and present results both at international conferences and in scientific journals.
- You will do practical bench chemistry for the preparation and testing of the catalyst systems. For characterisation, high pressure and high temperature reactors and spectroscopy techniques are available.

- You will investigate structure-reactivity relationships, and rationally tune the catalyst toward desired products
- You will assist the research group with limited educational tasks in topics related to your research.

#### Advisor

[Mark Saeys](#)

#### Funding

Vlaio

#### Candidate Profile

##### Requirements

- Holder of a Master degree in Chemistry, Chemical engineering, or similar.
- Strong analytical skills and some experience in catalysis and bench chemistry
- A strong interest in catalysis
- You work independently and have a strong feeling of responsibility both for your project and for lab safety
- Some experience with computational chemistry is a plus
- A good proficiency in English (oral and written)

#### How to apply and application process

Apply before 1 October 2023 by sending an email to [vacatures.saeys@ugent.be](mailto:vacatures.saeys@ugent.be). Your application should include:

- your resume (curriculum vitae)
- motivation letter
- a copy of your diploma and diploma supplement (with overview of all courses followed)

Qualified candidates will be invited for an initial brief interview as applications are received and evaluated.

This PhD position is available immediately (starting date limit at 1 January 2024) and is open until the vacancy is filled. The position is not open for post-docs.

More information: [max.bols@ugent.be](mailto:max.bols@ugent.be) or [mark.saeys@ugent.be](mailto:mark.saeys@ugent.be)

#### A Ph.D. at UGent and the LCT

We offer a challenging, stimulating, young and pleasant research environment where you can contribute to solving real-life problems for technological innovations with a clear societal as well as economic value. The UGent doctoral school program offers possibilities for following a range of courses or trainings of your interest. We foresee a competitive remuneration and the possibility to obtain a PhD degree in Engineering. You will receive a PhD grant for 4 years, with an evaluation after the first year (1+3 contract).

This PhD offers a unique opportunity to dedicate yourself to relevant research questions in catalysis in an applied, industrially relevant, and collaborative framework. Your workplace (LCT) is an international environment with intense contacts with industry, and with professionally engineered and operated experimental facilities. The LCT is embedded in the University of Ghent, a world-renowned research university. The M. Saeys research group is focused on catalysis and technologies for CO<sub>2</sub> conversion with expertise in modelling-guided catalyst design coupled to experimental kinetic validation and state-of-the-art characterization. The lab offers opportunities to guide master students and to support education.

The offer includes:

- A 100% PhD Scholarship (1+3, coupled with a positive evaluation after Y1).
- Full-time employment with 36 days of holiday leave per year.
- Well-equipped labs with experimental and computational facilities

- A pleasant work climate and collegial atmosphere in an international and interdisciplinary research team.
- Weekly (at least) contact with your colleagues and supervisors to share your knowledge, discuss the problems you might have, and collaborate on a solution.
- Optional social activities are typically organized by the team members and supported by the lab.
- You will be allowed to travel abroad (conferences) to communicate your scientific breakthroughs.
- A huge training offering (Doctoral Schools) that supports you during your PhD and prepares you for your future career.
- Bicycle allowance, benefits regarding public transport.
- Above all we offer you a Ph.D. degree with very good credentials for future employment.

Fellowship: ~ € 27.000 net per year including health insurance and other social security benefits.

More information:

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