Funded PhD position:

Multiphase CFD for electrified reactors (ERC e-CAPTURE)

Electrified reactors

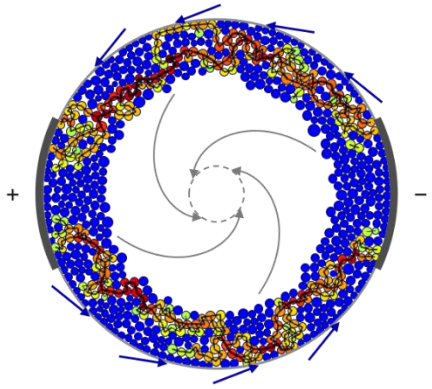
Joule heating in a swirling particle bed

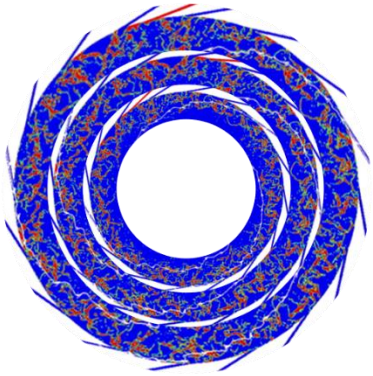
Multiphase CFD

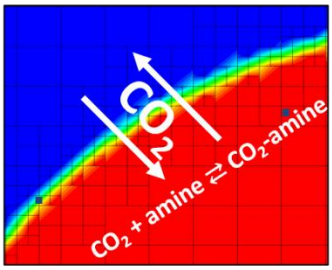
Gas liquid flow and CO_2 absorption in a vortex reactor

Funded by the European Union

European Research Council







Do you like novel reactors, simulations and reactive flows, and do you want your work to help cut CO_2 emissions? Join us as a PhD student and build the simulation tools we use to design compact, electrically heated reactors for CO_2 capture.

ABOUT GHENT UNIVERSITY
Ghent University is a world of its own. Employing more than 15.000 people, it is actively involved in education and research, management and administration, as well as technical and social service provision on a daily basis. It is one of the largest, most exciting employers in the area and offers great career opportunities.
With its 11 faculties and more than 85 departments offering state-of-the-art study programmes grounded in research in a wide range of academic fields, Ghent University is a logical choice for its staff and students.

For the Laboratory for Chemical Technology (LCT), Department of Materials, Textiles and Chemical Engineering, Faculty of Engineering and Architecture at Ghent University, we are looking for a m/f/x:

DOCTORAL FELLOW

IN MULTIPHASE CFD FOR ELECTRIFIED REACTORS (ERC E-CAPTURE)

AIM

Develop and use multiphase CFD (computational fluid dynamics) to understand and design electrified vortex reactors, in which gas and liquid, or gas and solid particles, are brought into intense contact.

CONTEXT

Most CO_2 capture plants today use tall columns, where a liquid solvent absorbs the CO_2 and is then heated with steam to release it again. These plants are big, expensive and use a lot of energy.

In the ERC project e-CAPTURE, we replace these columns with vortex reactors. A fast swirling flow creates a centrifugal field many times stronger than gravity, without any moving parts. Mass transfer between gas and liquid becomes much faster, so the reactor can be much smaller. Electric (Joule) heating puts the heat right where it is needed and can run on green electricity. Other PhD students in the team run the experiments on our prototypes. This position focuses on the modelling, in close collaboration with them.

YOUR TASKS

- Simulate gas liquid flows in vortex reactors: swirling liquid layers, bubbles and droplets, and how CO_2 moves from the gas into the solvent and reacts there. Add electric heating to the simulations in for example conducting particles.
- Develop new models and algorithms where standard CFD falls short, for example for mass transfer and fast reactions in very turbulent flow.
- Validate the models against high speed imaging and PIV measurements from the experimental team.
- Use the validated models to design better reactors: run many geometries on a supercomputer, train fast machine learning models on the results, and search for the best design.

WHAT WE ARE LOOKING FOR

- By your start date, you hold a master's degree in chemical engineering, or in a close field such as mechanical, process or energy engineering, or physics. Students who graduate in 2027 are welcome to apply now.
- You have a solid basis in reactor/reaction engineering, heat and mass transfer, and fluid mechanics.
- You enjoy programming and simulations. Experience with Python, C++, OpenFOAM, Ansys Fluent or a discrete element method (DEM) code is a plus.
- You are curious and careful, and you like to discuss your results with both modellers and experimentalists.
- Excellent communication skills in English – both oral and written.
- Living in Belgium or ready to stay in Belgium during the research.

WHAT WE CAN OFFER YOU

- We offer a full-time position as a doctoral fellow, consisting of an initial period of 12 months, which - after a positive evaluation, will be extended to a total maximum of 48 months.
- Your contract will start on 01/04/2027 at the earliest. The start date is flexible within 2027.
- The fellowship amount is 100% of the net salary of an AAP member in equal family circumstances. The individual fellowship amount is determined by Team Personnel Administration based on family status and seniority. A grant that meets the conditions and criteria of the regulations for doctoral fellowships is considered free of personal income tax. Click here for more information about our salary scales
- An international team at the Laboratory for Chemical Technology.
- Access to the supercomputers of the Flemish Supercomputer Centre (VSC).
- Training in CFD, scientific programming, high performance computing and machine learning, and the chance to present your work at international conferences.
- All Ghent University staff members enjoy a number of benefits, such as a wide range of training and education opportunities, 36 days of holiday leave (on an annual basis for a full-time job) supplemented by annual fixed bridge days, bicycle allowance and eco vouchers. Click here for a complete overview of all the staff benefits.

PROMOTERS

Prof. Yi Ouyang and Prof. Kevin Van Geem

FUNDING

Funded by the European Union through the ERC Starting Grant e-CAPTURE (grant agreement 101220341). Project page: cordis.europa.eu/project/id/101220341

INTERESTED?

Send one PDF to Yi.Ouyang@UGent.be with the subject “PhD multiphase CFD”. Please include:

- your CV
- your transcripts of records (bachelor and master), with your class rank if you have it
- a copy of your master’s diploma(if already in your possession)
- a motivation letter of at most one page
- the names and email addresses of two referees
- Important remark: do not exceed 5 MB! Request in a separate email (without an attachment) whether your application has been received well.

Deadline: 15 February 2027. We invite shortlisted candidates for an interview. We do not accept late applications.

As Ghent University maintains an equal opportunities and diversity policy, everyone is encouraged to apply for this position.

For more information about this vacancy, please, contact Prof. Yi Ouyang (Yi.Ouyang@UGent.be).