PhD position at IFP Energies nouvelles (IFPEN)

Process and Environment Engineering, Fluid Mechanics.

Numerical Simulations of Reactive Taylor Flows

The Process Experimentation division at IFP Energies Nouvelles focuses on designing, constructing, operating and maintaining pilot facilities to support research projects carried out by other divisions or with industrial partners.
In a general trend of process intensification and due to a gain in interest of microfluidic applications in green chemistry, the objective of the thesis will be to develop a predictive numerical tool for the design of continuous miniaturized reactors. The thesis will focus on homogeneous catalysis for oligomerization of ethylene.
There are significant challenges in modelling the coupled physics involved in micro-reactors, as gas-liquid multiphase flow with capture of sharp interfaces, phase change, heat transfer, and chemical reactions are involved altogether.
The program of the thesis will be:

1. Literature review
2. Simulation of single phase hydrodynamics of G/L Taylor flows.
3. Simulation of phase change and mass transfer in G/L Taylor flows.
4. Simulation of heat transfer in G/L Taylor flows.
5. Simulation of reactive Taylor flows. Kinetic model for dimerization of ethylene to 1-butene.

The candidate should be a fluid mechanics engineer with a specialization in CFD and chemical engineering. Highly motivated by numerical modeling and by its application to industrial R&D, the successful candidate should possess a real ability to adapt and a good capacity to work in teams in an international environment.

Keywords: CFD, Fluid Mechanics, OpenFOAM, Multiphase, Heat and Mass transfer, Chemical reaction.

Academic supervisors	Dr. Joëlle AUBIN, Laboratoire de Génie Chimique (UMR5503 CNRS/INP/UPS) Pr. Hrvoje JASAK, Faculty of Mechanical Engineering and Naval Architecture (FAMENA) of the University of Zagreb
Doctoral School	MEGEP, Génie des Procédés et de l'Environnement, http://www.ed-megep.fr
IFPEN supervisor	Dr. Lionel GAMET, Experimentation Intensification Dept., lionel.gamet@ifpen.fr
PhD location	IFP Energies nouvelles, Lyon, France
Duration and start date	3 years, starting not earlier than September 2020
Employer	IFP Energies nouvelles, Lyon, France
Academic requirements	University Master / Engineering school degree
Language requirements	Fluency in French and/or English
Other requirements	Fluid mechanics, CFD, Mass and heat transfer. Chemical engineering, Knowledge in catalysis and reactive flows. Programming (C++ language, Shell scripting, Linux). Python, C, other languages will be a plus.

For more information or to submit an application, see www.ifp-school.com/formations/theses or contact the IFPEN supervisor.

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 www.ifpenergiesnouvelles.fr.
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.