

## Ph.D. position: Experimental study of high-pressure oxy-flames for carbon capture and sequestration

The **EM2C CNRS Laboratory**, located in CentraleSupélec at the **Université Paris-Saclay**, invites applications for a Ph.D. student position on the study of oxy-combustion for carbon capture and sequestration.

Oxy-combustion is considered a key process in decarbonizing power plants and heat production in several industries. The combustion with pure oxygen yields high  $\text{CO}_2$  concentration enabling efficient carbon capture.

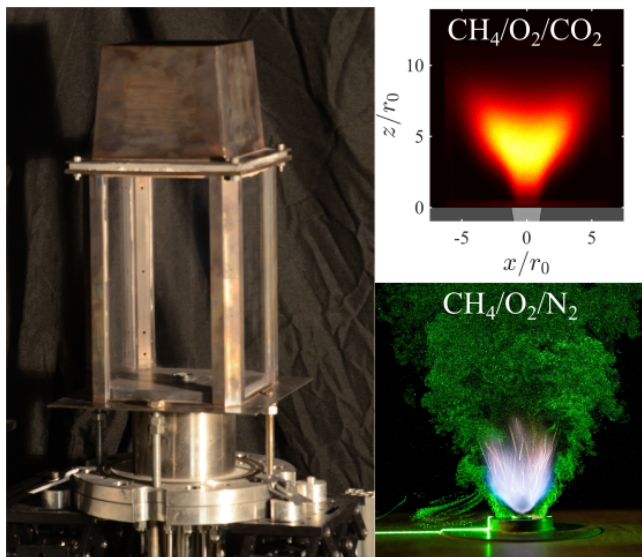


Figure 1: The OxyTec combustor at atmospheric pressure. Chemiluminescence  $\text{OH}^*$  image of  $\text{CH}_4/\text{O}_2/\text{CO}_2$  flame and  $\text{CH}_4/\text{O}_2/\text{N}_2$  flame with Mie-scattering of PIV particles.

The thesis takes place in an ambitious nationwide project to improve knowledge and skills in oxy-combustion. The consortium of eight academic partners gathers specialists around two approaches: chemical looping combustion (CLC) for biomass and oxyfuel flames for biogas. The project is based on the consortium's recognized expertise in advanced diagnostics applied in oxy-combustion experimental facilities and high-performance numerical simulation to build refine databases and numerical modeling tools for the development of sober, high energy efficiency technologies applicable in an extensive range of applications: gas turbines, boilers, glass, steel, power, and cement plants.

### Description of Ph.D. position

The EM2C CNRS Laboratory is seeking a highly qualified candidate for a Ph.D. fellowship in the area of **experimental and modeling of combustion and heat transfer**. The successful candidate will join the EM2C research team led by Pr. Ronan Vicquelin to study oxy-combustion in a high-pressure combustor.

This work combines experiments and modeling to study stabilization, heat transfer, and pollutant formation of swirled oxy-flames as a function of injection parameters and dilution. Measurements based on advanced laser-based optical techniques will be performed on an atmospheric pressure OxyTec experimental bench (Figure 1) and a laboratory-scale high-pressure test facility. Physical analysis and comparisons with multi-physics simulations carried out in parallel at the EM2C laboratory

will identify the key mechanisms to derive low-order models. The research outcomes will be published in the major high-impact international journals.

## Candidate profile

We are looking for highly motivated, committed, and creative individuals, able to work in a team and with excellent communication skills. Working in a top-level research environment with advanced laboratory infrastructure, you will have a unique opportunity to develop your research abilities.

You are expected to have an excellent MSc or Engineer School degree in mechanical engineering, combustion, energetics, or physics. You have an appetite for experimentation and physical analysis. Ideally, you have experience and a proven track record in one or more of the following areas: combustion, laser diagnostics, fluid dynamics.

## How to apply

We look forward to receiving your application including

- CV
- Letter of motivation
- Copy of passport
- Copies of degree and academic transcripts (with grades and rankings)
- Contact details of two references (no reference letter needed).

Advisors : Dr. Clément MIRAT, Dr. Christopher BETRANCOURT, Pr. Ronan VICQUELIN

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Start : Between October 2022 and January 2023

Duration : 36 months

Gross salary : 25 k€/year + French national benefits

Location : Université Paris-Saclay, CNRS, CentraleSupélec, Laboratoire EM2C, 91190, Gif-sur-Yvette, France.