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## PhD PROPOSAL

# Experimental investigation of flame dynamics in porous media combustion

Reference : **MFE-DMPE-2024-04** (to recall in all correspondence)

Thesis start date: October 2024 (can be adjusted)

**Application deadline:** if you got this document online, you can still apply

## Key words

Combustion, porous, flame describing function, experiments

## Ideal Candidate

We are seeking a highly motivated, innovative, and detail-oriented candidate with a strong background in combustion and experimental research methods. Proficiency in designing and conducting experiments, as well as analyzing experimental data, is essential. The candidate should demonstrate a genuine interest in pushing the boundaries of knowledge within the realm of porous media combustion through hands-on experimentation.

Flames in porous media, at the frontier of combustion physics, harbor the potential for groundbreaking advancements in energy efficiency, emissions control, and combustion system design. This doctoral research opportunity invites PhD candidates on a journey into the realm of experimental investigations to unravel the relationship between porous media structure and flame behavior.

## Thesis Overview

Under certain conditions (e.g. lean premixed combustion, high energy density systems), **combustion instabilities** can occur, leading to system fatigue or damage, and additional pollutant emission. The focus of the project is to overcome these instabilities by means of porous media combustion, immersing the flame within a solid and inert porous matrix. In this comprehensive study, the selected PhD candidate will study the domain of **porous media combustion** and explore new relations between the porous solid structure and combustion instabilities through experimentation.

This research project involves designing and conducting experiments that explore flames within a diverse range of porous architectures. The investigation spans a wide spectrum of pore topologies and sizes to assess their influence on flame behavior. The research endeavor is focused on deciphering how flames react to perturbations within the complex spatial configurations of the pore network. Additionally, the study aims to identify the key parameters governing flame stabilization, propagation, and extinction within porous structures, with a particular emphasis on correlating these findings with porous parameters like porosity, tortuosity, and heat conductivity. The research will culminate in the development of phenomenological models that encapsulate the insights gained, crucial for future optimization of porous combustion systems. Strong collaborations with experts in numerical research are planned.

## Benefits

The PhD candidate will have the opportunity to be at the forefront of combustion research, contributing to the development of clean and efficient energy technologies through experimental work. This research serves as a platform for honing skills in designing and conducting experiments, as well as analyzing and interpreting experimental data. The findings from this study can have profound implications for industries such as power generation, transportation, and environmental engineering.

## Collaborations envisagées

This PhD thesis will be pursued in parallel of another PhD position, focusing on the numerical aspect of this problem. Close collaboration between the PhD students is expected.

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