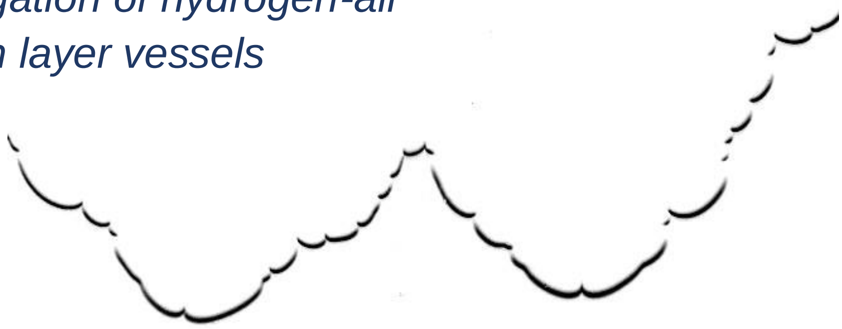
# **Postdoc position** in Combustion Science

Institut Mécanique et Ingénierie Aix Marseille Université

## *Experimental / numerical investigation of hydrogen-air flames propagating in thin layer vessels*



Available at IRPHE and M2P2
in **Marseille**, French riviera, France

*(deadline June,11 2021)*

## Context

In the context of greenhouse gases reduction, intense research is focused on hydrogen, but it rises questions in terms of safety and control that need to be clarified in order to use it in domestic, transportation and industrial processes. Its wide range of flammability limit and its small quenching distance increase the potential risk of hydrogen leaks. The precise description of the flame propagation is of prime importance, especially in confined environment. In such configurations, the closeness of burner walls can have either a damping effect, by absorbing the thermal energy of the flame, or facilitating effect, by imposing distortion and acoustic coupling. As a result, some unexpected flame propagation modes can emerge [1]. The local phenomena at play and the global implication on the dynamics of the whole flame propagation have to be investigated both experimentally and numerically, in order to draw the limits of potential risk of flame propagation in a defined configuration.
A collaboration program recently started between combustion laboratories IRPHE and M2P2 on the propagation of premixed flames in thin layers, with experiments in Hele-Shaw cells[2-3] conducted at IRPHE and numerical simulations conducted at M2P2[4-5].


[1] https://doi.org/10.1103/PhysRevLett.124.174501
[2] https://doi.org/10.1103/APS.DFD.2014.GFM.P0036
[3] https://doi.org/10.1017/jfm.2020.562
[4] https://doi.org/10.1016/j.combustflame.2019.09.029
[5] https://doi.org/10.1016/j.combustflame.2020.07.030


## Postdoc's description

The postdoc will consist in adapting current studies to hydrogen-air flames. Visualization issues will have to be addressed to get the flame position and the velocity field, in particular close to the walls of the burner. These quantities will give insight into the physical transfer of momentum and energy to the burner's walls. Schlieren and interferometric techniques will be used to track the global hydrogen flame shape and the global quantities like the flame speed. Additional LASER Particle Image Velocimetry (PIV) techniques will be adapted to obtain velocity fields on a slice of the domain. Small scale description will be facilitated by the use of numerical simulations in connection with the experiments. For this purpose, use and extension of a promising Lattice-Boltzmann method (LBM) dealing with multi-component reactive flows is in the scope of the postdoc position.

## Conditions

Application due date : June 11, 2021.— Starting date : September–November 2021.— Contract duration : one year, with possible extension. **Net** salary: from **1982€/month to 2323€/month** depending on experience.
Applicants will hold a Ph.D. degree in Physics or Mechanical Engineering. The position requires **some** of the following skills: **Experimental** and visualization technique skills, to adapt the existing experiments to hydrogen flames. **Coding** and software development skills in order to adapt the existing Reactive Lattice Boltzmann Method to the hydrogen reaction, physical parameters, and experimental configurations.


Email to christophe.almarcha@univ-amu.fr and pierre.boivin@univ-amu.fr with CV, cover letter, and references.


irphé
Institut de Recherche sur les Phénomènes Hors Equilibre

M2P2