PhD position available

Hydrogen and Ammonia to produce heat and power

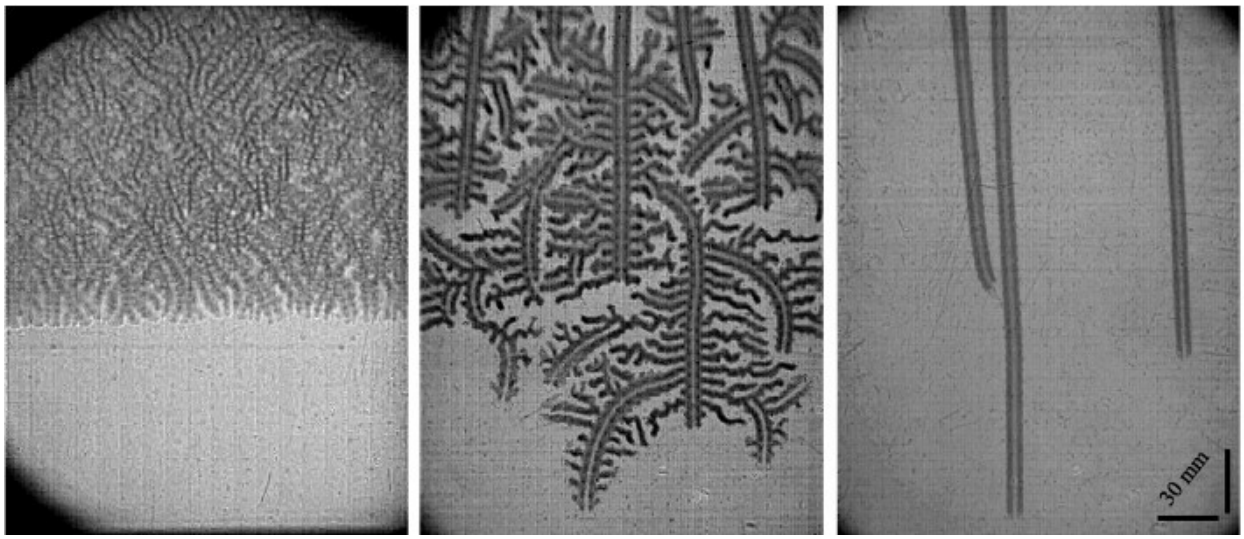
Deadline: March 15th, 2021

Scientific Context

The use of green fuels is the most promising technique to include renewable energy sources into high-temperature applications that cannot make use of wind and solar power. Although some fuels like hydrogen, ammonia and natural gas have been classified as strategic in the future energetic system, different concerns associated with their direct utilization, storage and safety have interfered with the development of the technology that would allow a massive use of these environmentally friendly fuels. Their feasibility for the direct application in established technology is to be demonstrated. Cutting-edge technology specifically designed for those is still to be proposed.

This project addresses fundamental questions related to the use of alternative fuels by means of experimental, numerical and theoretical approaches. On one side, it focuses on the numerical-experimental analysis of the combustion of hydrogen and hydrogen-ammonia and hydrogen-natural gas mixtures in a semi-confined combustion chamber that mimics, in a simplified version, the design of some engines. On the other side, reforming energy vectors (ammonia, biofuels, methane and synthetic fuels) to produce hydrogen that will be later oxidated to produce energy will also be investigated. The inclusion of ammonia in reactive mixtures calls for a proper description of its reduced chemical kinetics, a nearly unexplored area, of NH_3 and NH_3/H_2. The project also considers safety concerns associated with undesired leakage, combustion and explosion of storage facilities containing these fuels.

Leaving aside the technical particularities of this study, this project is framed within the social-economic challenges imposed by the necessary energetic transition. The interest of hydrogen and hydrogen-derived fuels as a key player in the energetic future has sparked an international interest that has promoted the initiation of several projects with the same global strategic mission of developing an environmentally sustainable technology capable of fighting global warming and build a low-carbon, climate-resilient future.



PHYSICAL REVIEW LETTERS124, 174501 (2020)

Candidate's profile

Essential Requirements: Applicants must hold a Master Degree at the beginning of the contract September 1st 2021.

The position requires knowledge of some of the following skills :

- Experimental and visualization techniques.
- Coding and software development skills: Matlab, Python, C++/Fortran.
- Strong background in Physics, Mathematics and Fluid Mechanics.

Conditions:

- Application due date : March 15th, 2021.
- Starting date : September 2021.
- Contract duration : Four years.

Contact:

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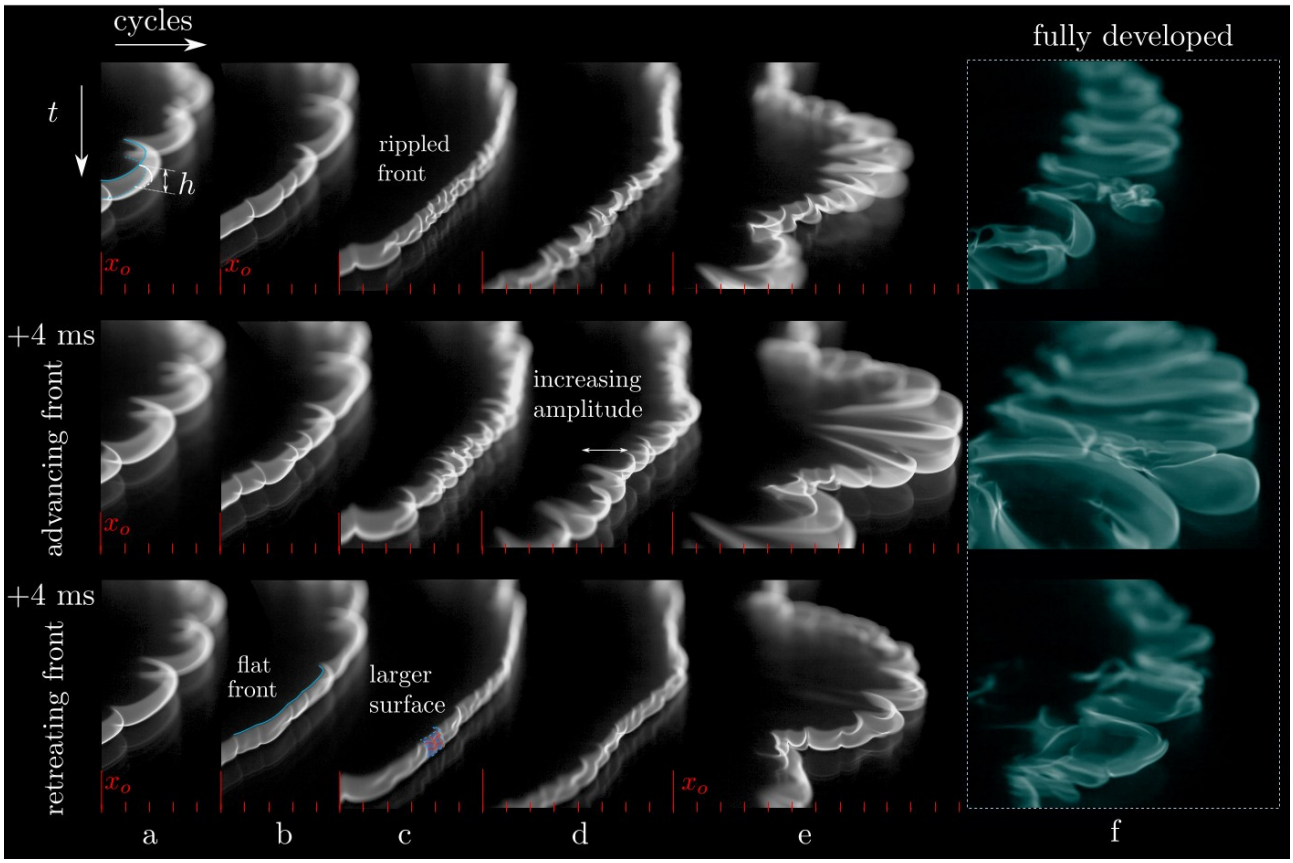

2018 APS/DFD Milton van Dyke Award