Institut für Technische Verbrennung

RWTH AACHEN UNIVERSITY

Project thesis or Bachelor thesis

Experimental Investigation of Premixed Ultra-Slow Propagating Flames

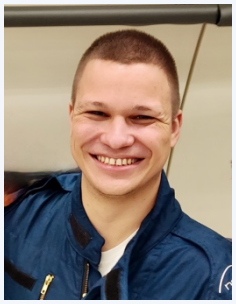
Topic is suitable for

- ✓ Project thesis
- ✓ Bachelor thesis

Field of activity

Laminar Flame Speed

Contact Person



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The laminar flame speed (LFS) is a key parameter for characterizing a combustible mixture, regarding its reactivity, exothermicity, and diffusivity. LFS affects the burning rate of fuel/air mixtures in practical combustion-system applications like internal combustion engines, turbines, and burners.

However, conventional methods fail to measure LFS for ultra-slow propagating flames, since enlarged time scales of the experiment lead to flames being deformed by buoyancy. It makes performance and fire safety analysis challenging for slow-burning fuels such as ammonia, which is considered as one of the zero-carbon-emission fuels of the future. Moreover, modern refrigerants with low global warming potential (GWP), which are of great interest for industrial applications, can not be properly evaluated regarding their fire hazard since their flame propagation speed is too low and flames are too curved at normal conditions. LFS of such fuels can measured either in microgravity or with modified mixtures (addition of O_2, H_2, etc.).

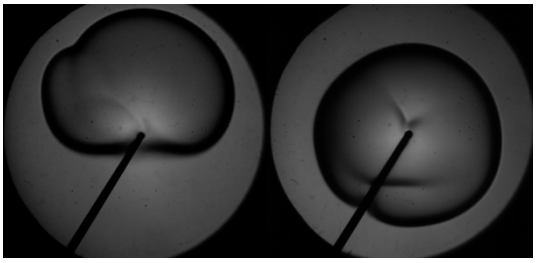

Figure 1. Exemplary images of ultra-slow flames at normal gravity (left) and microgravity (right).

In this thesis, experiments with slow-burning fuels will be conducted. First, the oxygen fraction in the oxidizer will be increased to enlarge the flame propagation speed and minimize the buoyancy effect. Then, mixtures with normal air will be investigated, in order to better understand the transition to buoyant flames. Finally, the effect of hydrogen addition on flame propagation will be analyzed.

Your tasks

- ◊ Literature survey of flame speed data
- ◊ Perform schlieren experiments
- ◊ Post-processing and analysis

About you

This thesis might be suitable for you if you:

- ◊ Are interested in hands-on work
- ◊ Have some experience with Matlab (desirable)
- ◊ Have knowledge in thermodynamics (desirable – in combustion)
- ◊ Are self-motivated and are willing to advance your knowledge and skills

If you are interested, this thesis can be combined with a HiWi position. Contact us for more details.

This thesis does not quite fit your ideas? Feel free to contact us to customize this topic or to find an alternative thesis.