Fluids and Space Engineering Seminar

Date: Wednesday, December 5, 2018 at 13:00
Location: ZARM, Room 1730

Combustion of Single Oxygen Droplets in Hydrogen – Experimental Setup & Numerical Modelling

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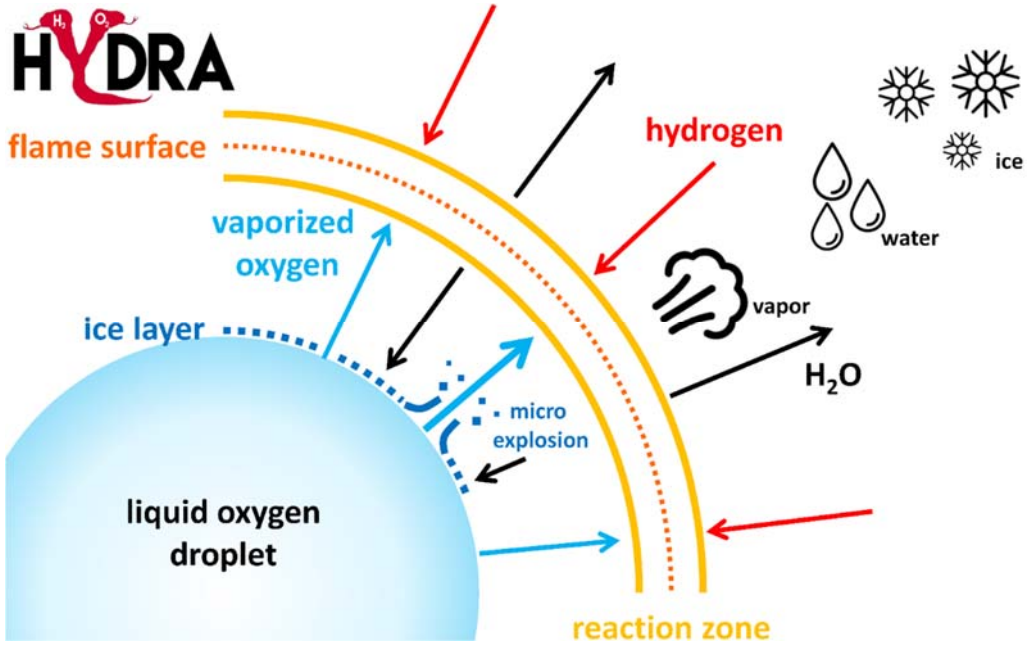

Hypothetical scheme of liquid oxygen combustion in hydrogen

In liquid rocket propulsion the liquid oxygen (LOX)/liquid hydrogen (LH_2) system is widely used owing to the resulting high specific impulse. Typically in this case the LH_2 enters the combustion chamber in pre-vaporized gaseous state and the oxidizer as droplets in the liquid state. To improve the fundamental understanding of this complex spray combustion process the DLR-funded project "HYDRA" focuses on its most basic element: the single droplet. Within this project a drop tower experiment is designed and built to conduct single LOX droplet combustion in hydrogen environment. Experiments are planned for pressures up to 52 bar, which corresponds to supercritical conditions. The droplet will be ignited by a laser induced plasma spark and the combustion will be observed by shadowgraphy, schlieren optics, OH-radical chemiluminescence as well as temporal and spatially resolved OH-planar laser induced fluorescence (OH-PLIF) diagnostics. Of primary interest are the inverted character of the system with the fuel as the homogenous phase and the oxidizer as the dispersed phase as well as the transition from the ignition to the quasi-steady combustion flame.
In this talk the experimental setup and the main technical challenges are presented. Furthermore, first results of numerical simulations developed in parallel will be discussed.