The GraVent DDT Database

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An online open-access platform providing data from DDT experiments conducted at the Institute of Thermodynamics, Technical University of Munich, is currently being developed and will be provided at **www.td.mw.tum.de** in the research section. This platform will serve as a source for scientists interested in experimental data for the purpose of theoretical or numerical analyses.

About 8000 explosion tests have been conducted at the "GraVent" facility which is an entirely closed explosion channel with a rectangular cross-section (0.3 m width; 0.06 m height) and up to 5.4 m length. A window section can be placed at arbitrary positions along the channel to allow for optical measurements. The explosion volume can be equipped with obstacles at a minimum spacing of 0.1 m.

Hydrogen-air mixtures at ambient pressure and temperature prior to ignition have been examined so far. Both homogeneous mixtures and mixtures with transverse, vertical concentration gradients can be generated by injection of hydrogen through injection ports in the channel top plate, formation of a compact hydrogen layer and subsequent diffusion. Water can be injected into the explosion volume and distributed homogeneously to investigate the influence of evaporating droplets and their interaction with the explosion front.

Mixtures are ignited with a spark plug at one end of the channel. Effects of flame acceleration, transition to detonation and detonation propagation can be studied, see [1] for results. Photodiodes along the channel axis allow for tracking the flame front. Piezoelectric pressure transducers record explosion overpressure. Optical high-speed techniques have been applied, such as shadowgraphy, schlieren, OH* luminescence imaging and 20 kHz OH-PLIF.

We will provide both conventional data (photodiodes, pressure transducers) and results from optical measurements in the format of an open-access online platform. Various geometrical configurations (with and without obstacles) will be included. The database will continuously be updated with new experiments, for example detailed studies of explosion dynamics shortly after ignition that are currently being conducted. We are looking forward to sharing our data and hope to support scientists in gathering experimental data for validation of numerical models or theoretical analyses. The poster will explain our goals and show exemplary experimental datasets.

References

[1] Boeck, L.R. (2015) Deflagration-to-detonation transition and detonation propagation in H_2-air mixtures with transverse concentration gradients. Ph.D. Thesis, Technische Universität München.

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