



TECHNISCHE
UNIVERSITÄT
DARMSTADT

Bachelor/Master thesis (Experimental)

Ignition and burn time of single iron particles in oxygen-enriched atmospheres

Zündung und Brenndauer einzelner Eisenpartikel in sauerstoffangereicherten Atmosphären

Motivation

The project **Clean Circles** is dedicated to solving global energy problems by using iron as CO₂-free, renewable and efficient chemical energy carrier. First, electricity from renewables is used to reduce iron oxide (energy storage). Then, the iron is oxidized to release thermal energy for electricity generation at a different place and time (energy release). In the collaborative research project, scientists and students from different Universities work closely on numerous experiments and simulations.

Objectives

In this thesis, the ignition and burn time of single iron particles should be experimentally investigated. Using an existing laminar flow reactor, iron particles will be seeded in high-temperature and oxygen-rich environments, which are generated by lean methane flames. The ignition delay time and entire burn time will be measured with high-speed scientific cameras. At the same time, the particle size will be in-situ detected by measuring the shadow of particles. Different particle sizes will be investigated with increasing oxygen concentration in the gas atmospheres. By evaluating the data, the influences of particle size and oxygen concentration on the particle ignition and burn time should be focused on. This would provide a better understanding of oxidation stages at the single-particle level.

The topic is suitable for both Bachelor and Master theses, and the work tasks are adapted accordingly.

Tasks:

- Review the literature on iron combustion
- Perform optical experiments on a single-particle burner
- Data processing and evaluations
- Thesis writing and presentations

Requirements:

- Interest in lab work and knowledge of optical measurements and MATLAB is preferred.

This thesis can be written in English or in German.

Are you interested?

Dann melde dich bei mir! Feel free to contact me!

Beginn: Ab sofort! Soon!

Reaktive Strömungen und
Messtechnik (RSM)

Reactive Flows and
Diagnostics



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