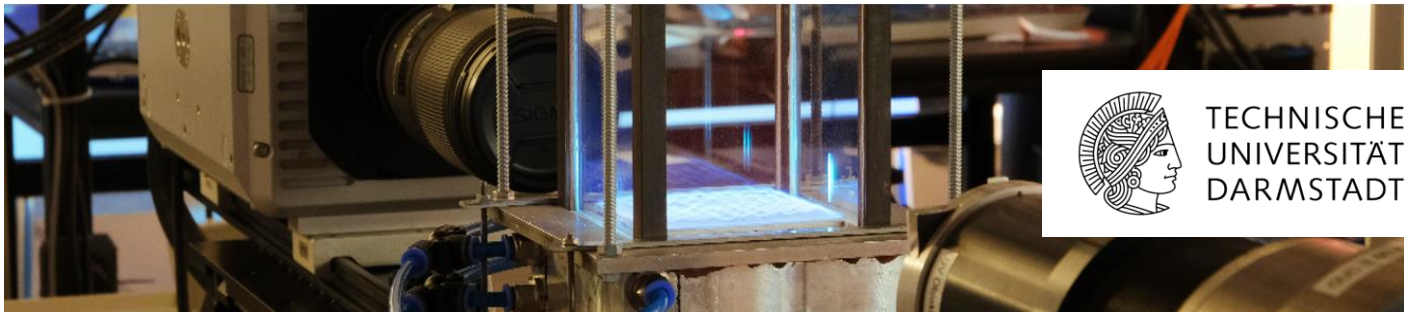

Master thesis (Experimental)

Entwicklung und Anwendung der lasermarkierten Hyper-Spektrum-Thermometrie für die Metallpartikelverbrennung

Development and Application of Laser-marked Hyper-spectrum Thermometry for Metal Particle Combustion

Reaktive Strömungen und Messtechnik (RSM)

Reactive Flows and Diagnostics

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Motivation

Accurate measurement of burning particle temperature is important to understand solid fuel combustion. Currently, the commonly adopted technique for this task is imaging two-color pyrometry, which acquires radiation intensities at two wavelengths and thus the temperature can be derived using Wien's approximation. However, two-color pyrometry is based on the grey-body assumption, which is not always valid or cannot be easily verified in experiments. Therefore, the accuracy of two-color pyrometry sometimes is uncertain. Hyper-spectrum thermometry is one promising technique that can significantly improve the measurement certainty and accuracy of solid particle temperature. It records the spectra of hot particles over a wide range of wavelength. By compare the recoded spectrum with Planck's law, often a part the spectrum obeying grey-body emission can be selected and thus particle temperature can be determined more accurately.

Objectives

The goal of this project is to develop the laser-marked hyper-spectrum thermometry for the measurement of burning metal particles. In the development stage, parameters, such as particle size variation, that could influence the calibration and hence measurement accuracy will be evaluated. In the application stage, the technique will be used to measure the temperature of burning iron particles. The measured temperatures will be then compared with that reported in literature.

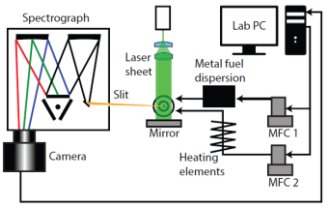

Figure. 1. Schematic of the optical measurement setup. (Courtesy of J. Hameete)

Tasks:

- Literature review on spectrometer and full-color pyrometry.
- Set up the spectrometer and get familiar with its operation.
- Sensitivity analysis of the spectrometer calibration.
- Application of the technique for determining burning metal particle temperature.
- Thesis writing and presentations.

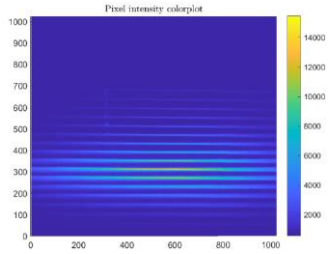

Figure. 1. Recorded Hyper-spectrum image of a burning iron particle. (Courtesy of J. Hameete)

Requirements:

- Interest in lab work
- Knowledge of Matlab and basic optics are preferred.
- Knowledge of LabVIEW, spectrometer, and black-body radiation is preferred.

Are you interested? Dann melde dich bei mir! Feel free to contact me!
Beginn: Ab sofort! Soon!