Technische Universität Braunschweig

Studien-/Masterarbeit

(englisch)

Evaluation of Thermocouple Attachment Methods for the Analysis of the Heat Release in Resonance Tubes

At the Institute of Space Systems (IRAS) at the Technische Universität Braunschweig, research is focused on sustainable in-space propulsion systems. Novel ignition methods for these systems such as resonance ignition are of high interest for this application. In a resonance ignition system, shock waves from an underexpanded jet lead to rapid heat up of the gas and the resonance cavity. Measuring the temperature distribution on the surface of the resonator critical to understand the heating behaviour. For this, thermocouples shall be attached on the outside of the resonator in different ways to evaluate the quality of the connection. Accurate temperature readings during the strong vibrations of a resonance heating run require both a thermally conductive and structurally robust connection. The thermocouple mounting methods shall be evaluated in resonant heating runs on the institute's test setup and evaluated against each other and other diagnostics like a thermal camera.

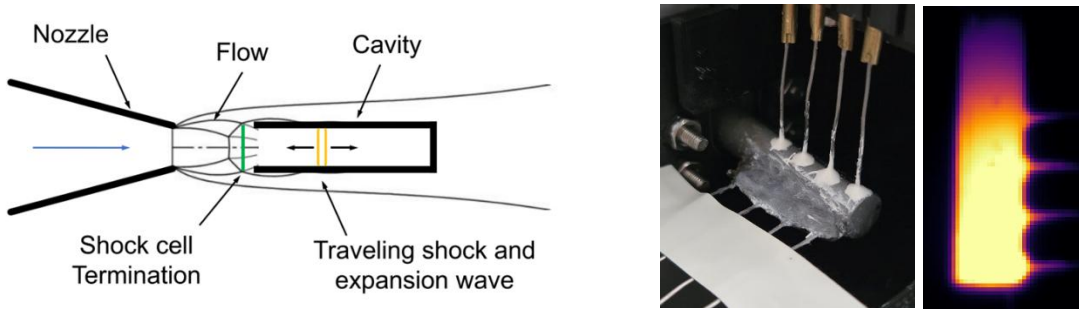

Figure 1: Left: Schematic representation of a nozzle and a resonance cavity with a shock structure (Jakob, 2023); Centre: Cylindrical resonator with spring mounted (top) and bonded (front) thermocouples; Right: Thermal image

Tasks and Deliveries Include:

1. Conduct a literature review, familiarise with the topic and experimental setup
2. Generate mounting concepts, design mounting parts and create a BoM
3. Assemble and integrate the thermocouple mounting concepts into the test setup
4. Conduct heating tests with each mounting concept
5. Evaluate the test data from the different mounting concepts
6. Document the outcomes in a comprehensive report and presentation.

Kontakt: M.Sc. Tom Linnemann
Tel. 0531 / 391-9973, E-Mail: tom.linnemann@tu-braunschweig.de
Hermann-Blenk-Str. 23, 38108 Braunschweig