Assistant Professorship of Sustainable Future Mobility
TUM School of Engineering and Design
Technical University of Munich

Automated Reduction and Optimization of Chemical Kinetic Mechanisms for SAF-Surrogate Fuel Combustion

Type: Bachelor Thesis / Semester Thesis / Master Thesis
Content: theoretical / numerical
Possible start: now

Job Description

Due to the ever-more urgent problem of global warming, the aviation industry is looking towards using Sustainable Aviation Fuels (SAF). While using SAF leads to a reduction in CO_2 emissions, and might even result in net carbon neutrality, the problem of non-CO_2 emissions, like nitrogen oxides (NOx) and soot, is not directly tackled. As the usage of current reaction mechanisms describing these phenomena are way to computationally expensive to be used by the aviation industry, the kinetic mechanisms need to be reduced without loosing their prediction capability.

This student thesis aims at the implementation of a optimization strategy for the reduced mechanisms. A detailed mechanism that predicts set targets well needs to be reduced, analyzes and then optimized. Due to the ever-changing composition of SAF and their surrogates this process needs to be done as automated as possible.

Your Tasks

- Develop and implement a method for optimization of reduced mechanisms
- Select and compare suitable detailed starting mechanisms
- Reduce and optimize the selected mechanism
- Perform reactive flow analysis to calculate relevant combustion characteristics
- Analyze your resulting mechanism to iteratively improve on the optimization method

Our Requirements

- Basic knowledge in chemical kinetics and programming (Python/C++)
- Ability to work independently
- Optional: Knowledge in combustion

Our Offer

- Gain inside into the research field of chemical kinetics
- Contribute to the implementation of sustainable fuels into the aircraft industry
- Work within an international research team

Contact

If you are interested in working in our team, please send your application to Michael Geuking (michael.geuking@tum.de).

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