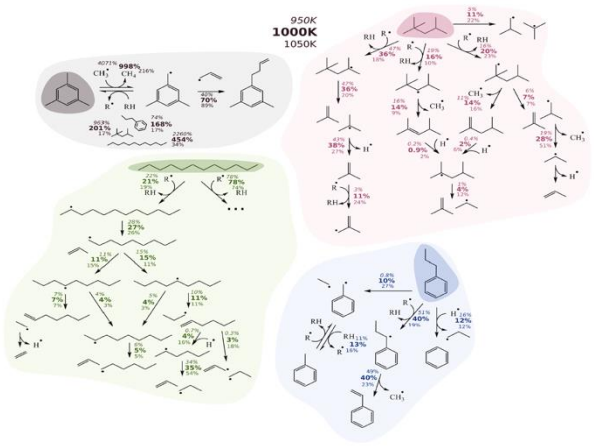
Assistant Professorship of Sustainable Future Mobility
TUM School of Engineering and Design
Technical University of Munich

Development of Design Tools (Model and Fuel Design) for Sustainable Aviation Fuels (SAF)

Type: Master Thesis in cooperation with Gesellschaft für Anlagen- und Reaktorsicherheit (GRS)
Content: Theoretical / Numerical
Possible start: As soon as possible

Job Description

Increasing costs of fossil fuels in combination with increased demands on reducing pollutant emissions require new types of engines that are able to provide the required performance with lower fuel consumption and minimal emissions, even with blends of kerosene and Sustainable Aviation Fuels (SAF). The existing design tools used to date for engine design must be expanded to include the specific properties of these new fuel mixtures. Of particular importance are the fuel composition, i.e., fuel design, and the data of the substances involved, i.e., fluid mechanics and thermodynamics, of the components and the mixture.



Rate-of-production analysis for the initial decomposition of a surrogate mixture.

Since the number of individual components of such fuels can exceed several hundred hydrocarbons, it is essential to define a surrogate that describes the mixture as well as possible in all its properties – fluid mechanical, thermodynamic, and chemical – with a minimum number of components, so that the tools can be used for engine design. The boiling behaviour, the transport by diffusion, or the specific heat release are of particular importance. The aim of the work is to determine an input formula of a surrogate that describes all necessary thermodynamic requirements of fuels. For this purpose, the characteristic material properties of conventional fuels are to be determined and described with the planned numerical codes.

Your Tasks

- Development of the module (algorithm and code) for the calculation of surface responses that approximate all necessary properties
- Design of the module for optimization of the input formula of surrogates – identification of the components of the fuel blend and their proportions

Recommended Prior Knowledge

- Background in thermodynamics, chemical kinetics, numerical modelling
- Working ability in Matlab/FORTRAN/Python/C++
- Able to communicate in English or German

Contact: If you are interested in this topic, please send your application to Agnes Jocher (agnes.jocher@tum.de). If you have any questions, do not hesitate to contact us.

Prof. Dr.-Ing. Agnes Jocher

Publication date
3rd February 2023