Ongoing Projects

- Energy Innovation Center (EIZ), BMBF funding ID 03SF0693A, ILB application number 85056897.
- BTU-BAM graduate school „Trustworthy Hydrogen“.
- Waste biorefinery technologies for accelerating sustainable energy processes (WIRE), COST Action CA20127.
- TURBO Fuel Cell 1.0, funding ID 03EWS002A.

Competencies

- Development, optimization, and reduction of kinetic models for hydrocarbon redox reactions and interaction with NO_x chemistry.
- Development of multi-dimensional models coupled with detailed surface chemistry for calculation of conversion rates and heat release in reactors.
- Development of models for lithium-ion battery calculations.
- Development of real-time capable models for use in software for control and regulation of steady-state and dynamic combustion engineering systems.
- Development and optimization of chemical energy storage systems based on the Power-to-X process.

Site Plan

Contact

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Thermal Process Engineering
Siemens-Halske-Ring 8
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- Cottbus is located in southern Brandenburg, approximately midway between Berlin and Dresden. Cottbus is easily accessible by car via the A13/A15.
- To reach us by public transport, take bus line 16 from Cottbus main station to the Papitzer Straße stop.

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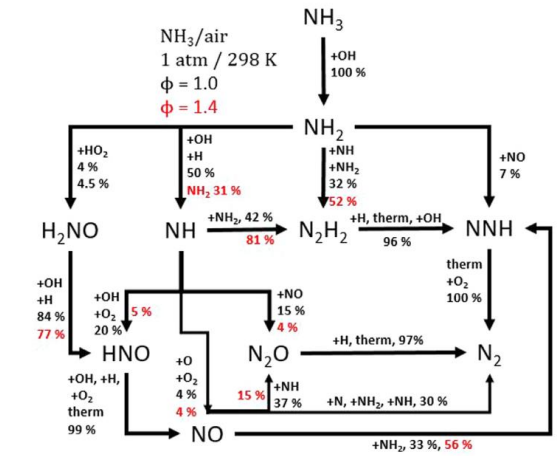
Chair of Thermodynamics/ Thermal Process Engineering

Institute for Electrical and Thermal Energy Systems

Prof. Dr.-Ing. Fabian Mauß

Fuel Modeling

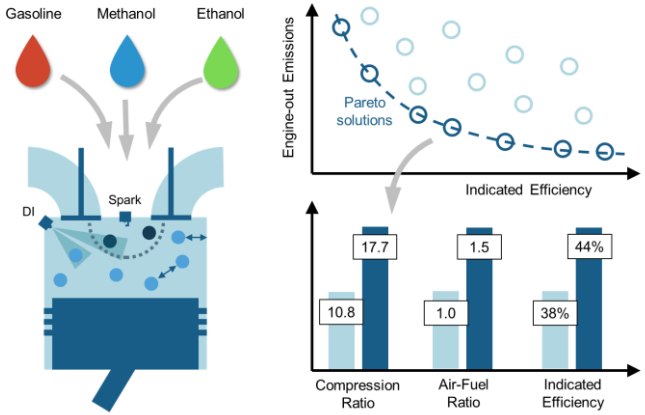
The models developed at the chair for carbon, hydrogen and nitrogen-based fuels describe the thermodynamics, transport processes and kinetics of technical combustion. The fuel models are validated using experiments from our own fuel database. The results are published in peer-reviewed scientific journals. Due to the generality of the fuel models, they can be used to study the complex combustion processes in multi-dimensional simulations, and to predict the generation of air pollutants (such as unburned hydrocarbons, carbon monoxide, nitrogen oxides, nitrous oxide, and soot).



- Shrestha et al.; An experimental and modeling study of ammonia with enriched oxygen content and ammonia/hydrogen laminar flame speed at elevated pressure and temperature; 2021; 10.1016/ j.proci.2020.06.197
- Shrestha et al.; Detailed Kinetic Mechanism for the Oxidation of Ammonia Including the Formation and Reduction of Nitrogen Oxides; 2018; 10.1021/ acs.energyfuels.8b01056

Engine Simulation and Optimization

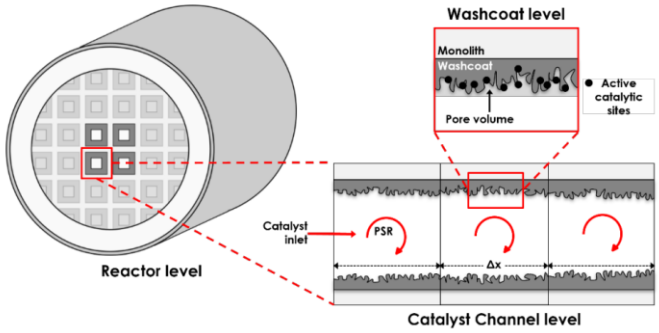
The engine models developed at the chair use the detailed fuel models to calculate the performance and formation of air pollutants in compression-ignition and spark-ignition engines. The multi-dimensional models describe the physical processes of fuel injection and evaporation, convective heat transfer, valve flow, and the generation of turbulence. Detailed chemistry describes turbulent flame propagation and auto-ignition of fuels. A tabulation method for the detailed chemistry reduces the computation time of the multi-dimensional simulation by several orders of magnitude, allowing the simultaneous optimization of engines and fuels.



- Siddareddy et al.; Real-Time Simulation of CNG Engine and After-Treatment System Cold Start. Part 1: Transient Engine-Out Emission Prediction Using a Stochastic Reactor Model; 2023; 10.4271/2023-01-0183
- Franken et al.; Gasoline engine performance simulation of water injection and low-pressure exhaust gas recirculation using tabulated chemistry; 2020; 10.1177/ 1468087420933124

Catalyst Simulation and Optimization

The chair develops multi-dimensional reactor models and catalyst models for detailed surface chemistry. The models are validated using experiments from the literature and in-house laboratory test rigs. The results are published in scientific peer-reviewed journals. The models are used to calculate the conversion rates and heat balance of various technical systems. These include the exhaust gas cleaning of combustion engines by means of three-way and methane oxidation and SCR catalysts, the production of synthesis gas by means of steam reforming and the production of "green" methane by means of the Sabatier process and "green" methanol by means of methanolization.



- Leon de Syniawa et al.; Real-Time Simulation of CNG Engine and After-Treatment System Cold Start. Part 2: Tail-Pipe Emissions Prediction Using a Detailed Chemistry Based MOC Model; 2023; 10.4271/2023-01-0364
- Richter et al.; Reaction Mechanism Development for Methane Steam Reforming on a Ni/Al2O3 Catalyst; 2023; 10.3390/catal13050884