Friedrich-Alexander-Universität
Technische Fakultät

Department Chemie- und Bioingenieurwesen (CBI)
Lehrstuhl für Energieverfahrenstechnik
Prof. Dr.-Ing. Jürgen Karl

Master's thesis

Modification for novel methanation reactor through CFD simulation

Content:

Heterogeneous catalytic methanation plays a crucial role in Power-to-Gas technology. A key challenge in this process is maintaining the temperature below the catalyst's maximum allowable limit to avoid catalyst sintering caused by excessive reaction temperatures. The conventional reactor commonly used for this reaction is a fixed-bed reactor with a cylindrical design, where numerous catalyst-loaded particles are packed.

To enhance the performance of the traditional fixed-bed reactor, the Chair of Energy Process Engineering has introduced an innovative concept involving a conic-shaped reactor bed. This approach not only limits the peak temperature within the reactor but also extends the high-temperature zone, which is more favorable for the methanation reaction.

This research primarily aims to investigate the effects of different modifications to the conic reactor shape on the reaction, with a focus on its impact on temperature distribution and methane conversion. Furthermore, it seeks to refine the existing CFD models used to simulate the methanation process within this reactor design.

Tasks:

- Literature research: catalytic methanation and relevant simulation.
- 3D CFD simulation in ANSYS Fluent.
- Evaluation of the influence of the different modifications of reactor shapes on the reaction according to the simulation results.
- Improving the existing CFD models
- Written documentation of the thesis.

Your profile:

- Basic knowledge of CAD and CFD-Simulation (favorable but not mandatory)
- Working independently
- Teamwork with the supervisor

Start: from now

Contact:

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