Lehrstuhl für Energiesysteme
TUM School of Engineering and Design
Technische Universität München

Masterarbeit

(Theoretical)

Electrolysis at high pressures: CFD Simulation for Comparison of Different Electrolysis/Fuel Cells

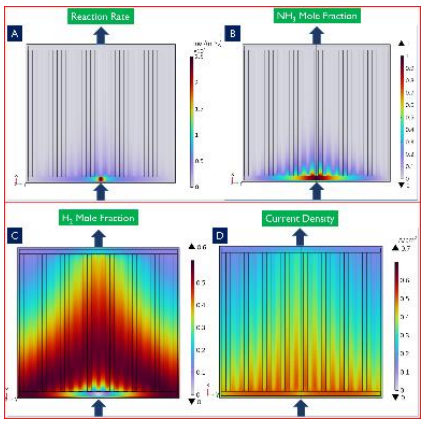
Beschreibung:

Reversible solid oxide cells (rSOC) have the capacity to produce hydrogen or syngas using the electricity generated from the intermittent renewable sources, and to reverse the process within the same system for generating electricity as well. Namely, the technology has the potential to play a central role in green energy systems.

It is a fact that increasing operating pressure enhances the efficiency of rSOCs in fuel cell mode, which also saves energy required for compressing the product gases after electrolysis. However, rSOCs are intrinsically quite fragile and their operations under high pressures are challenging. rSOCs can be designed in various concepts, such as electrolyte-supported, anode-supported etc., each has advantages and disadvantages in terms of their electrochemical and mechanical performances. The main goal in this thesis is to predict and compare the electrochemical performance of different rSOC designs of the state-of-the-art under pressure and reversible operation. For conducting these investigations, a thermo-electrochemical model will be developed for rSOCs, considering the charge transfer, mass transfer, momentum transfer, and heat transfer as well as the operating conditions and material properties. Operations of different rSOC designs will be simulated and their performances will be evaluated. Finally, the work will be documented.

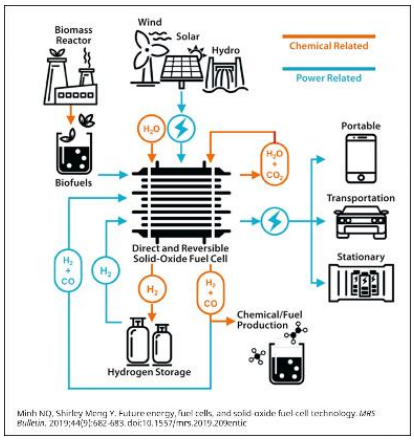
Requirements (optional)

- Strong interest in energy conversion technologies
- Interest in electrochemical energy conversion technologies
- Basic knowledge about numerical modelling
- Basic knowledge about fuel & electrolyzer cells



Work packages:

- Studying thermo-electrochemical modeling of rSOCs
- Development of thermo-electrochemical model of rSOCs
- Evaluating different state-of-the-art rSOC designs
- Written documentation of the thesis



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