Master Thesis Student

Model-based Investigation of PEM Water Electrolysis

Research area
- Batteries
- Fuel cells and electrolysis
- Electrolysis / Power-to-X

Alignment
- Experimental
- Electrical Characterization
- Material analysis
- Development of measurement technology
- Modeling & Simulation
- Literature Research

Course of study
- Electrical engineering and IT
- Mechanical Engineering
- Chemical Engineering
- Physics
- Material Sciences
- Industrial Engineering

Language
- English
- German

Starting date
ASAP / Upon agreement

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Motivation

Hydrogen plays a central role in the energy transition. Polymer electrolyte membrane water electrolysis (PEMWE) is a key technology for hydrogen production. The central research question is how to improve the performance and reduce degradation. Particularly, the water splitting reactions at the anode is the largest obstacle. Highly active electrocatalysts are, thus, needed to reach high conversion rates. For the development of such catalysts, it is crucial to understand the electrochemical processes and the their changes during operation.

The topic of the master thesis will be to investigate the reaction processes on electrocatalysts for water splitting both experimentally and using a physico-chemical model. First, electrochemical measurements on novel Iridium oxide based catalysts will be performed (20% of the time). Further, an existing microkinetic model in matlab will be adopted and optimized in order to deepen the knowledge on the catalyst performance and stability, the catalysts surface states and their limitations (80% of the time).

Areas of responsibility:
- Literature research
- Electrochemical measurements, e.g. cyclic voltammetry, impedance spectroscopy and chronoaamperometry in the lab
- Model optimization (in Matlab) and simulation
- Model validation with the experimental data
- Evaluation and interpretation of the results

Application

Enjoy an exciting topic in the field of sustainable and green energy technology and work together with a motivated and interdisciplinary team in a friendly working atmosphere. We offer excellent support throughout the duration of the master thesis. Additionally, your work would be a valuable reference for the future vacancies at the institute. If we have raised your interest, please feel free to contact us. We kindly ask you to send your CV and current transcripts to goezde.kardes@kit.edu. If you have further questions, do not hesitate to contact Mrs. Kardes.