



## Bachelor/Master Thesis

# Elektrochemical Charakterization of a Power-to-Chemicals Processes

### Research area

- Batteries
- Fuel Cells and Electrolysis
- Electrocatalysis

### Orientation

- Experimental
- Electrical Characterization
- Material Analysis
- Development of a measurement Technique
- Modelling
- Simulation
- Literature Research

### Course of Studies

- Electrical Engineering
- Mechanical Engineering
- Chemical Engineering
- Physics
- Mathematics
- Industrial Engineering

### Start

From 01.10.2023

### Contact

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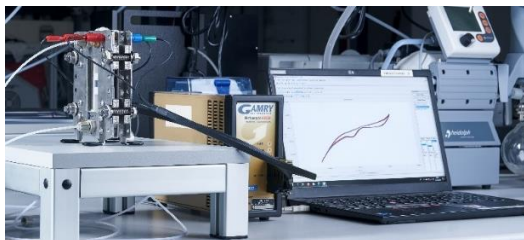
<http://www.iam.kit.edu/et/>

### Motivation

We are looking for a motivated and dedicated Bachelor's/Master's thesis candidate who is interested in contributing to the electrochemical characterization of a power-to-chemicals process. This exciting work offers the opportunity to make an important contribution to the energy transition and reduce the use of fossil fuels in large-scale chemical processes.

Research and implementation of sustainable technologies in the chemical industry are gaining in importance, especially with regard to the energy and raw material turnaround. The conversion of complex chemicals using electrical energy is a promising key technology that is becoming increasingly relevant due to the growing demand for sustainable solutions. This creates an environmentally friendly alternative to conventional chemical processes. Despite the enormous potential of such power-to-X processes, a systematic and technical analysis is still lacking. Our bachelor/master thesis aims to fill exactly this gap and to contribute to the research and further development of this promising technology.

The aim of this work is the electrochemical characterization of a specific power-to-chemicals process. In the first step, the system is to be characterized electrochemically, with general system properties such as conductivity, overpotentials of the main reaction and possible side reactions being investigated. Furthermore, kinetic parameters of the process will be measured for the first time.



### Task

The bachelor's/master's thesis involves performing experimental work using an existing rotating disk electrode measurement setup. Within this framework, various electrochemical measurement techniques will be applied, including the recording of polarization curves, cyclic voltammetric, chronoamperometric and electrochemical impedance measurements. Based on the theoretical principles of these methods, the characteristic properties of the system will then be determined.

### The work is divided into the following tasks:

- Familiarization and literature research
- Performing electrochemical measurements:
  - Measurement of polarization curves at different operating conditions.
  - Voltammetric measurements for dynamic analysis of reaction and trans-por influences of electrochemical reaction.
  - Application of electrochemical impedance measurements to determine system characteristics.
- Interpretation and analysis of experimental data, taking into account the theoretical basis of the methods used.
- Documentation of the results

### Note

We offer excellent supervision and the opportunity to work in an interdisciplinary team on a future-oriented topic. The IAM-ET is a constantly growing institute with expertise in battery, fuel cell and electrolysis research at the South Campus. For questions about the topic, contact Paul Neugebauer. No previous experience is required.