Institut für Angewandte Materialien
Elektrochemische Technologien
Adenauerring 20 b
76131 Karlsruhe

Master thesis

Kinetic Modeling and Simulation of Glucose Oxidation on Au Catalyst

Field of Science

☐ Batteries
☐ Fuel Cells and Electrolysers
☒ Electrocatalysis

Focus

☐ Experimental
☒ Electrochemical characterisation
☐ Material analysis
☐ Development of setups
☒ Simulation
☒ Literature research

Studies

☒ Electrical Engineering
☒ Mechanical Engineering
☒ Chemical Engineering
☒ Physics
☒ Chemistry
☐ Industrial Engineering

Starting Date

directly / upon agreement

Contact person

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Project Overview: The Master thesis aims to develop a robust electrochemical process for green hydrogen production and value-added, decarbonized chemicals by electrolysis of glucose. The approach of Biomass-based hydrogen production addresses an alternative to conventional high-energy demanding water electrolysis. The thesis will be in collaboration with researchers of KIT IAM-ET and Université Grenoble Alpes.

Your task focusses on the investigation of reaction and transport processes at gold catalysts by experiment, and modelling and simulation. You will analyze the impact of the catalyst and local pH at the electrode/electrolyte interface on the performance and selectivity during glucose electrolysis. The insights will allow you to quantify key process parameters and identify bottlenecks of the process. Your gained knowledge will support the optimization of electrode materials and process conditions for glucose electrolysis.

Embark on an International Research Journey!
This master thesis is part of an interdisciplinary exchange project between KIT IAM-ET and the Université Grenoble Alpes, Laboratoire d'Electrochimie et de Physicochimie des Matériaux et des Interfaces (LEPMI). The research will be conducted primarily at the Université Grenoble Alpes with financial and organizational support by IAM-ET. We promise an enriching experience with interesting research and networking opportunities and international visibility, that is valuable for your future career.

Specific Tasks:

- Adapting and validate an existing kinetic model for glucose oxidation on Au-catalysts
- Identify key parameters using data from literature and experiments (e.g. from electrochemical measurements and concentration measurements)
- Identify limiting processes and analyze changes in local pH
- Provide knowledge for optimization of electrode preparation and process conditions.

This thesis does not require experience in electrochemistry! Understanding of chemical kinetics as well as good physical-mathematical skills and experience in programming are beneficial.

How to apply:

If you are interested in participating in this international exchange as part of your master's thesis, please email us with a brief description of your background and a transcript of records to arrange a meeting (supervisor: Swantje Pauer, swantje.pauer@kit.edu).