Karlsruher Institut für Technologie

European Institute
for Energy Research
by EDF and KIT

Institute for Applied Materials
Electrochemical Technologies
Adenauerring 20 b
76131 Karlsruhe

Master thesis

Influence of Water Impurities on PEM Water Electrolysis Performance

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 persons

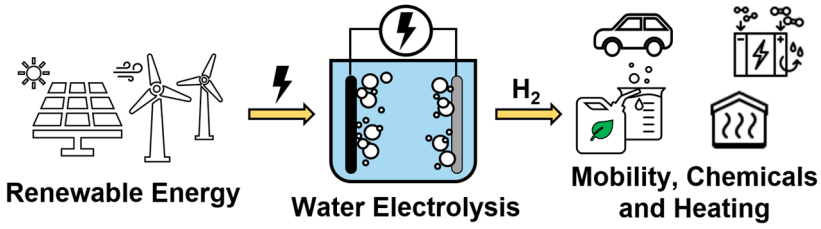
KIT – IAM-ET
Mareike Sonder
+49 721 608-48935
mareike.sonder@kit.edu
https://www.iam.kit.edu/et/english/index.php

EIFER
Aline Léon
+49 (0) 15170567595
aline.leon@eifer.org

Become part of the energy transition!

The production of green hydrogen by polymer electrolyte membrane water electrolysis (PEMWE) is an important building block of the energy transition. For stable operation, very pure water is required, since impurities such as metal ions, salts, or organic compounds can reduce performance and accelerate material degradation. A systematic understanding of how such impurities influence electrolysis performance is still missing but is essential for reducing water purity requirements and making PEMWE more robust and cost-effective.

In this work, commercial catalysts for PEMWE will be studied under laboratory-scale electrochemical testing in the presence of defined water impurities. Experiments will be conducted to evaluate how different impurity types and concentrations affect catalyst activity, degradation, and stability over time. Post-mortem analyses using electron microscopy will provide insights into the mechanisms behind performance loss. The results will help establish impurity thresholds and support the development of more impurity-tolerant PEMWE systems.



Tasks:

- Literature review on water impurity types and their effects on electrolysis performance.
- Electrochemical measurements with varying impurity types and concentrations to assess changes in catalyst activity and stability.
- Post-experimental characterization to identify degradation pathways.

About IAM-ET and EIFER:

This thesis is carried out in close collaboration between IAM-ET and the European Institute for Energy Research (EIFER), an international research center in Karlsruhe working on sustainable energy solutions. We offer excellent supervision, flexible working hours and the opportunity to work on a cutting-edge topic in an interdisciplinary team with expertise in the field of battery, fuel cell and electrocatalysis research. Independent work and the motivation to work on current research topics are required. For further information, please contact Mareike Sonder or Aline Léon. If you are interested, please send a current CV and a transcript of records to mareike.sonder@kit.edu or aline.leon@eifer.org.