

Institute for Applied Materials Electrochemical Technologies Head: Prof. Dr.-Ing. Ulrike Krewer

High-Temperature Solid Oxide Cells for Sustainable Energy Conversion

In the urgent need of fulfilling the goals of the global climate protection and to achieve independent energy supply, the coupling of different energy sectors remains as a major challenge. Regarding this issue, reversible solid oxide cells (SOCs) represent a promising key technology. These cells have the ability to generate electrical energy in fuel cell mode and reversely produce hydrogen and valuable synthetic gases with the help of sustainable gained energy. Beyond such stationary applications, current research is also focused on applying solid oxide fuel cells (SOFCs) in the aircraft sector in order to decarbonize it in the future.

Within the scope of different projects operated in the research group of "Fuel Cells and Electrolysis" at the Institute for Applied Materials – Electrochemical Technologies, cells developed and manufactured at partners from industry and science are investigated and modeled on different scales. These results contribute to further cell optimization and the derivation of business strategies. The characterization of a cell includes the development of a testing procedure, mounting the cell into the test bench and the operation of different series of measurements planned and operated by the intern. Thus, the cell performance can be analyzed by electrochemical impedance spectroscopy and the subsequent analysis of the distribution of relaxation times. In the following evaluation, appropriate software developed at our institute is available and can be used after a comprehensive introduction. Furthermore, simulation models on various scales enable a deeper insight into the physicochemical processes taking place and contribute to a better understanding of these.





To fulfill the tasks during the internship, basic skills in laboratory work and programming are required as well as a save handling in MS excel. Additional skills in Matlabtm, COMSOL Multiphysics[®] or comparable are generally favored.

During weekly meetings, the progress of the work will be discussed regularly. Finally, the results of the internship shall be presented in the frame of a seminar presentation to the research group.



In 2022, 2023 as well as 2024 we already took part in the DAAD RISE program and successfully supervised students during the summer at our institute.

You are interested in applying your academic knowledge in a highly present field of research? For Summer 2025, we are looking once again for a student interested in the field of sustainable energies and high-temperature solid oxide cells for a research internship at this institute. We offer great supervision in an interdisciplinary and multi-cultural team with the opportunity of taking part in a meaningful project. It is our goal to integrate you as a valued team member and set a learning environment for you. Please note, the internship has to be performed in person and cannot be hold virtually.

Additionally, the intern will have the opportunity to develop friendships and connections with KIT students through their coworkers and participate in the vibrant KIT culture through regular social gatherings at the institute, including summer barbeques and several welcoming gatherings.

The city of Karlsruhe offers a friendly and welcoming environment with plenty of things to explore. Living in the area of the city, most of the places can be reached by bike, such as the campus of the university. In addition, Karlsruhe is located close to the well-known black forest with manifold options for hiking and exploring nature. Further destinations can easily be reached by Karlsruhe's great connection to the German railway system. Therefore, weekend trips to France and Switzerland are possible.

We are looking forward to your convincing application.

Best regards,

Daniel Ewald and Daniel Esau

contact information:

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