

Master Thesis

Design of a biofuel cell for optimized long-term operation

Flexible start date

Located at the Chair for Energy Process Engineering, a focus group for *Bioelectrocatalysis* is currently being established as part of the new assistant professorship for Distributed Energy Process Engineering. Biological catalysts (enzymes, microorganisms, etc.) offer various areas of application such as medical technology, waste treatment and environmental technology, and they have numerous advantages over conventional catalytic systems. The “building blocks” of biological origin of the bioelectrochemical systems are often less sensitive to contamination and act more specific in heterogeneous substrate media. Their origin from renewable sources, the mostly biocompatible, non-toxic properties, as well as the possible operation under moderate conditions (pH, temperature, pressure) make electroactive biocatalysts particularly interesting for applied fundamental research on alternative energy systems.

As part of this master's thesis, an innovative design of an enzymatic fuel cell is to be developed to extend the operational time. Different electrode compositions are to be analyzed and compared. A final design validated with various characterization methods is to be tested and documented in a long-term experiment under optimized cell parameters.

Tasks:

- literature research on bioelectrochemical systems, especially on enzymatic fuel cells, networking methods and cell geometries
- optimization of a bioelectrochemical cell structure
- design and functionalization of various electrode surfaces with redox enzymes
- experimental planning and implementation for testing the electrodes by varying various parameters
- evaluation of the measurement results
- written documentation of the work and preparation of the results

Requirements:

- motivated, independent way of working; organizational talent
- enjoying experimentation on a small scale
- familiarity with work in the chemistry laboratory is advantageous (pipetting, clean work, dexterity)
- working language: English or German

Literature:

- A. Trifonov et al., ACS Nano 2013, 7, 12, 11358-11368, <https://doi.org/10.1021/nn405218x>
- K. Herkendell et al., Nano Research 2019, 12, 4, 767-775, <https://doi.org/10.1007/s12274-019-2285-z>



Contact:

Prof. Dr. Katharina Herkendell
Room 2.1.21, Fürtherstr. 244f, 90429 Nürnberg
Phone: +49 911 5302-9032
E-Mail: katharina.herkendell@fau.de