Master thesis

Cultivation of the electroactive model organism *Geobacter sulfurreducens* for the analysis of energy metabolism

Electroactive microorganisms have the unique ability to exchange electrons with electrodes. The underlying process is called extracellular electron transfer (EET). By means of EET, the microbial metabolism can be coupled with the flow of electric current. Therefore, electroactive microorganisms have great potential for applications in microbial electrochemical technologies. For example, they can be used in microbial fuel cells to break down organic material in wastewater and transfer electrons to electrodes, providing electrical energy. Other applications include nitrate removal from water and sustainable chemical synthesis. With the help of EET, electroactive microorganisms also influence many natural processes such as the carbon cycle and can be found in numerous habitats and microbial communities (e.g. the human gut microbiome).

Geobacter sulfurreducens is a model organism for EET, with which many fundamental insights into physiology, electrochemical kinetics and gene expression have already been gained. In contrast, the energy metabolism and thermodynamics of *G. sulfurreducens* and other electroactive microorganisms have been studied only sporadically, but are crucial to evaluate the energy efficiency of microbial electrochemical technologies and thus advance their application.

In this M.Sc. thesis, *G. sulfurreducens* will be cultivated under different conditions in order to determine parameters such as biomass yield, energy dissipation and biomass conservation coefficients. In addition to electrochemical methods and anaerobic cultivation techniques, analytical (HPLC) and molecular biological (PCR, T-RFLP) methods will also be used. Optionally, the experimental work can be supplemented by modeling (COMSOL Multiphysics®).

The work will be carried out with modern laboratory equipment in an international and multidisciplinary team and excellent supervision in accordance with the supervision guidelines of the Helmholtz Association and the UFZ is guaranteed throughout the preparation of the Master's thesis.

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