Engler-Bunte-Institut|
Wasserchemie und Wassertechnologie

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Determination of the fouling development on the electrodes

in direct seawater electrolysis

Challenge:

For the production of green hydrogen vast amounts of demineralized water are required for electrolysis. Within the hydrogen flagship project (H2MARE) of the German Federal Ministry of Education and Research, the coupling of off-shore wind energy with water electrolysis and other technologies for the production of e.g., e-fuels and green hydrogen is explored. In an attempt to reduce the overall water and area footprint on an off-shore production platform direct seawater electrolysis has been investigated for is viability, especially towards novel electrode materials. Due to the rather complex composition of seawater (e.g., salts, nutrients), electrode materials for electrolyzers need to be screened for their fouling affinity and its impact in quality and quantity of the produced hydrogen.

Tasks:

In this study the fouling potential of different electrode materials (anode and cathode) will be investigated and its impact on the gas production in both chambers of a lab-scale flow-through seawater electrolyzer. Fouling will be induced by a model organism (*Bacillus subtilis*) and investigated under different medium compositions (e.g., salt content) and operation conditions (e.g., applied current density). The fouling on the electrodes will be quantified in-situ by means of optical coherence tomography and analyzed through digital image analysis for the determination of biofilms parameters (e.g., thickness, coverage). The biofilm parameters will be coupled with electrochemical data and gas analysis to evaluate the impact of fouling in direct seawater electrolysis.

The results of the simulation are to be documented in written form and presented in a public lecture (e.g., institute's seminar).

Type:	Study Project or Master Thesis (WSE, CIW, BIW)
Starting date:	earliest Mid-April 2025
Supervisor:	M.Sc. Andreas Netsch
Examiner:	Prof. Dr. rer. nat. Harald Horn