

Masterarbeit**Design of a bioelectrochemically improved anaerobic digester using CFD simulations**

Content:

Electromethanogenesis is an emerging biomethane production technology that integrates microbial electrolysis cell (MEC) with conventional anaerobic digester (AD) filled with digestate. In this system, the organic matter is oxidized at the anode and the resulting carbon dioxide and protons are reduced to methane gas by electromethanogenic microorganisms in the biocathode with an applied external voltage. Computational fluid dynamics (CFD) is an effective tool for building mechanistic models in electromethanogenesis research and can be used to simulate and predict different parameters. This is key to design, evaluate and optimize the production of biomethane from biomass on the electrodes and create efficient bioreactors.

This master's thesis aims to use CFD simulations to investigate the influence of different geometrical and operating parameters on the performance of a microbial electrolysis cell (MEC). To do this, the student will use ICEM software for the initial geometry and mesh of the bioreactor and the electrodes and Fluent software to configure the rest of the parameters (characteristics of the digestate, reactions, material, etc.). When a functional model is obtained, changes will be made to the design to test new configurations that give better results.

Tasks:

- Literature research on electromethanogenesis, MEC and CFD.
- Reactor geometry and mesh construction using ICEM 19.1
- Setup of reactor conditions and characteristics using Fluent 19.1
- Testing of different reactor conditions (electrode configuration, mixing rate, scale).
- Validation of results with data from laboratory experiments.
- Clear interpretation/discussion of results.
- Written documentation of work.

Your profile:

- Interest and motivation for CFD simulations and reactor design.
- Knowledge and experience in the use of CFD simulation tools.
- Good self-organisation skills.
- Independent working style.
- Working language: English.

Start: immediately.

Contact person:

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