ROBUST ELECTRODIALYSIS,
FROM DRINKING WATER TO BIO-ETHANOL PRODUCTION

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BACKGROUND

C&B, C&G, L&W, M, L&V

LANGUAGE

English/Dutch

MORE INFO

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Introduction

Biochemicals and biofuels are rapidly gaining importance as building blocks for a sustainable economy. The process streams coming into these processes are quite complex and to handle these, sophisticated treatment technologies are needed. Electrodialysis (ED) is one such potential technology and combines electric fields and ion-exchange membranes to remove ions from a solution. Traditionally used in (seawater) desalination applications, ED is less susceptible to fouling compared to traditional pressure-driven processes. However, the high organic load in bio-based process streams remains a challenge.

Methodology

In this master thesis, you will try to design the ED process, so that membrane fouling is reduced. A model describing ED has been developed from equations of flow, transport and electrostatics to describe this process. These equations are implemented in Julia, an open-source programming language for high performance computing. The behaviour of organic foulants in the ED stack will be studied and included in the model to describe the fouling of the ion-exchange membranes. Simulations of the system with the improved model will help in optimising the performance.

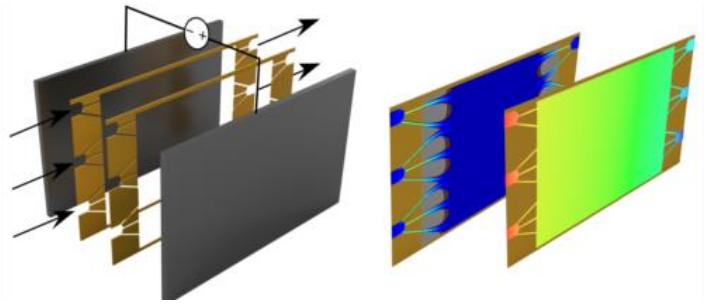
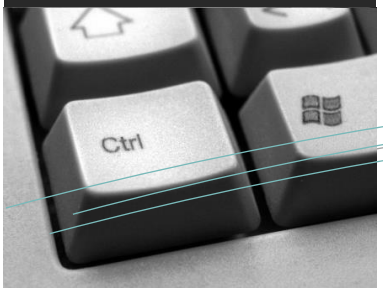


Figure 1: 3D representation of an electrodialysis stack (left) with the expected flow fields and salt concentration in the spacer channels (right)**.**

Objectives of the thesis

The main objective of this thesis is to further extend the electrodialysis model with a model describing the fouling behaviour and to optimise the performance. However, depending on the personal interests the focus of this thesis can shifted to,

- Experimental work
- Model-based design
- Machine learning models (AI)



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