Plan Overview

A Data Management Plan created using DMPonline

Title: PhD - Towards the design of industrially relevant CO2 electrolysers

Creator: Gerard Prats Vergel

Principal Investigator: Tom Burdyny

Affiliation: Delft University of Technology

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ORCID iD: 0000-0001-8057-9558

Project abstract:

The industrialization of CO2 electrolysers is a critical step towards obtaining carbon-based products from CO2 and renewable energy. Although CO2 electrolysis has demonstrated promising potential at the lab scale, challenges remain in meeting industrial requirements for energy efficiency, cost, and long-term stability. This PhD aims to shorten the temporal gap between the current state-of-the-art CO2 electrolysers and the demands of industrial applications. To draw relevant conclusions, we need to critically test the proven lab concepts under real industrial conditions. In this work, we first aim to evaluate the feasibility of using PGM-free anodes in CO2 electrolysers with a reverse-bias bipolar membrane (r-BPM) cell configuration at an industrial scale. However, the energy costs associated with the r-BPM are likely to limit their industrial feasibility. Future work will investigate the discrepancies in reported cell voltages of CO2 electrolysers under similar conditions and develop strategies to lower the cell voltage to industrial standards.

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PhD - Towards the design of industrially relevant CO2 electrolysers

Summary

Project Acronym

Project Number

TFTC46

Provide a dataset summary

There are two main dataset types: experimental and modelling. The experimental datasets consist mainly of raw data from GC (.xlsx), MFM (.txt) and potentiostat (.xlsx). The data size is between 1-1000 KB. This data is processed by a built-model and stored in a masterfile (.txt) where all the experimental information is also included. In the masterfile it can be found, the date of the experiment, the experimental conditions (concentration anolyte, anolyte, current density, etc) and the results obtained (FE CO and H2, cell voltage).

The modelling dataset consists of the several versions of the model developed (python or excel, 1-1000 KB) as well as the data that is derived from them (.txt or excel, respectively). The results obtained from the model will be stored in separate textfiles.

It is expected that the sum of the data generated and stored will be in the range of the GB.

FAIR data and resources

1. Making data findable

Data is stored and classified in several folders according to their area (e.g: Modelling, experiments, literature, writing-papers, presentations, etc). Each file has a name with the date of creation, and a short description of what it contains. In addition, readme files can be find with further specific instructions that help finding the data. For experimental data, an overview file can be find with a detailed description of the conditions of each experiments (with units), the project it pertain to and the day of the experiment. This logging file can be used to correlate the experiments done with the data presented.

For papers, the data will be published and stored in the data repositorium 4TU (https://data.4tu.nl/) . It will be findable through a DOI created for the dataset. The DOI specific for the dataset will be attached to the paper.

2. Making data openly accessible

The data will be openly accessible using the least restrictive license: CC-BY. Our objective is to enhance the sharing and use of the knowledge we have generated as much as possible.

The data will be available as soon as the paper is published, via the 4TU data repository: (https://data.4tu.nl/) . From the publisher website it will be accessible through the dataset DOI created in the data repository.

3. Making data interoperable

To make data interoperable a masterfile will be provided, in which the experimental conditions together with the results obtained from the experiments are summarised. The experimental conditions include the anolyte identity, anolyte concentration, anode and cathode material, and current density. The results will mainly consist of the cell voltage, faradaic efficiency for different products and the mass flow meter data. In addition, the methodology will be described in the paper. It is expected that with all this information, anyone can reproduce the exact same experiment.

4. Increase data reuse

The data will be shared using the 4TU data repository under the license CC-BY.
The masterfiles created and the experimental logging excel file aim to facilitate the reuse and reproducibility of the data obtained.

5. Allocation of resources and data security