Plan Overview

A Data Management Plan created using DMPonline

Title: Mesophilic and thermophilic microbial fuel cells: removal of organic matter and generation of electrical energy with optimization of external resistance

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Project abstract:

The microbial fuel cell (MFC) is a technology that enables the direct conversion of organic matter into electrical energy from wastewater treatment. However, there are still limitations to be overcome for the optimization of the technology, aiming at a future scaling. Thus, this project aims to analyze the effect of temperature rise together with the optimization of external resistance for the parameters of energy generation, removal of organic matter, in addition to identifying the main microbial communities developed. The study will be carried out with a bench scale tubular MFC, applied to the treatment of synthetic effluent simulating vinasse. Six MFCs (R1, R2, R3, R4, R5 and R6) will be operated under continuous flow, where they will be studied in 3 conditions/phases, all with a value of 5 gCOD/L. Phase 1 for standardization of all units, phase 2 with external resistance change (22.5Ω) in reactors at room temperature (R1, R2 and R3) and at 55ºC (R4, R5 and R6). In phase 3, the MFCs will be submitted to an organic load of 20 gCOD/L in order to evaluate the influence on the Coulombian efficiency and potential of the MFC. The R3 and R6 reactors have a different membrane design, with a reduced size, in order to reduce the cost of reactor construction and optimize its configuration. The analysis of the effluent treatment efficiency is being evaluated through the analysis of physical-chemical and electrochemical parameters. To determine the internal resistance, the polarization curve and the electrochemical impedance spectroscopy technique are used.

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Data Collection

What data will you collect or create?

Data on physical and chemical parameters (Table 1) were produced weekly, by collecting samples twice a week from the cathodic and anodic chambers. After collection, the samples were submitted to analysis and organized in spreadsheets to facilitate visualization and calculation of treatment efficiency.

Table 1: Physical-chemical parameters

Parameter	**Method**	**Frequency**
Temperature	Thermometer	Online monitoring
Dissolved oxygen	Luminescence	1x a week
pH	Electrometric	2x a week
Conductivity	Electrometric	1x a week
Chemical oxygen demand	Closed reflux	2x a week
alkalinity	Titration	1x a week
Total Organic Carbon	high temperature combustion	2x a week
ammoniacal nitrogen NH4+-N	selective ion	2x a week
Nitrate, NO3--N	ion chromatography	2x a week
Nitrite, NO2--N	ion chromatography	2x a week

To acquire the temperature data from the MFCs, the USB6009 data acquisition system (National Instruments) was used, connected to the computer with the monitoring software. The system automatically converts the recorded data into spreadsheets. As well as the temperature data, the data of the physicochemical and electrochemical parameters were organized in spreadsheets helping in the visualization and evaluation of the evolution of the system.

How will the data be collected or created?

Documentation and Metadata

What documentation and metadata will accompany the data?

The metadata will include information about:
- How the samples was collected
- Which method has been used
- How the quality of the data was verified
- The date were the samples was collected
- Graphs of the acquired results

Ethics and Legal Compliance

How will you manage any ethical issues?

As the data collected in this study will not include human or animal participants, there are no ethical considerations to be made

How will you manage copyright and Intellectual Property Rights (IPR) issues?

We will publish the results in open access journals if funds are available.

Storage and Backup

How will the data be stored and backed up during the research?

The data before publication will be stored in clouds such as Google Drive.
After publication the data will be stored in websites such as Dryad Digital Repository or journals supplementary material.

How will you manage access and security?

The data will be shared trough the participant reserachers by allowing then to the clouds (Google Drive)

Selection and Preservation

Which data are of long-term value and should be retained, shared, and/or preserved?

All data collected will be preserved indefinitely.
At the end of the experiment, the biofilm adhered to the activated carbon (electrode) was removed from the anode and the cathode to later carry out the extraction of DNA from the microorganisms present, both the activated carbon with biofilm adhered and the DNA samples are being preserved in a freezer. at -80°C. In addition, samples collected weekly in horizontal freezers, allowing the reading of parameters such as pH, concentration of organic matter and chromatography.

What is the long-term preservation plan for the dataset?

Dryad Digital Repository or similar

Data Sharing

How will you share the data?

With the conclusion of the project and defense of the master's degree, we will make them available through publications of scientific articles, participation in congresses and in the Research Data Repository of the University of São Paulo, open to the community. Proper management of such data enables reuse and sharing. With this, we will seek to follow the recommendation based on the

F.A.I.R. (Findable, Accessible, Interoperable, and Reusable).

Are any restrictions on data sharing required?

There will be no restriction on sharing.

Responsibilities and Resources

Who will be responsible for data management?

A researcher is responsible for implementing this Data Management Plan as soon as
as the entire data lifecycle management. After storage no warranty responsibility for management will rest with the same following its policies. not that it is up to Data management will be directed towards FAIR data research.

What resources will you require to deliver your plan?

You will only need access to the repository