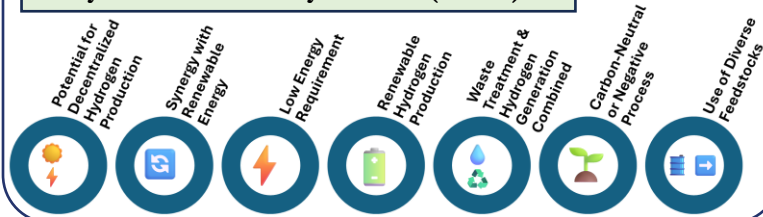


Green Hydrogen/Bio-Hydrogen Production with Microbial Electrolysis Cells (MECs)

Why Bio-Hydrogen?

- **Highest energy content** per unit weight among other gaseous fuels (143GJ/ton).
- It is a **Clean Fuel with only water as byproduct**, is rapidly produced from Biomass.
- **Utilizes waste** and is Environmentally friendly with **no CO₂ emissions**.
- Potential use in **hydrogen fuel cell vehicles (HFCVs)**.

Why Micro Electrolysis Cell (MEC)?



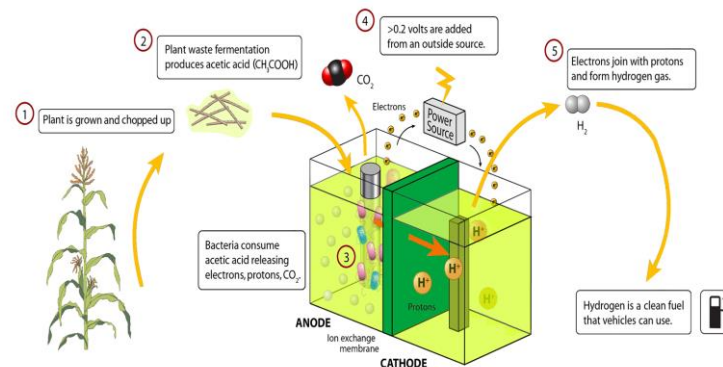
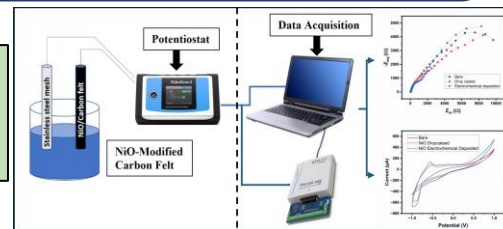
Factors influencing Bio-hydrogen production in MECs

	Electrode Material	Membrane Material	Design of Reactor	Feed Wastewater
Benefits	Green Energy Transition	Low Carbon Footprint	Decentralized Treatment	
Challenges	Expensive	Low Production Rate	Still in Infancy Stage	

Bio-Hydrogen yield in MECs with various substrates

Substrate	Predominant microorganisms	Biohydrogen production	Reference
Palm oil mill effluent	Geobacter, Pseudomonas sp	1.16 m ³ H ₂ /m ³ d	(Chandrasekhar et al., 2022)
Lignocellulosic hydrolysate	Enterococcus spp.	10.9 mol H ₂ /mol of glucose	(Wang et al., 2021)
Palm oil mill effluent	Geobacter sp., Desulfovibrio sp., and Thermoanaerobacterium sp.	134 ml-H ₂ /gCOD	(Khongkhiang et al., 2019)
Crude glycerol	Enterococcus sp., Acetobacterium sp., and Geoalkalibacter sp	0.46 L H ₂ /L/d	(Badia-Fabregat et al., 2019)

Development and Characterization of a High-Sensitivity NiO-Modified Carbon Felt



How do MECs work

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Aritro Banerjee is a Chemical Engineer with expertise in environmental science, water treatment technologies, design and process optimization, and microbial fuel cells (MFCs). As a PhD researcher at UiT, The Arctic University of Norway, his work focuses on developing MFC technology for wastewater treatment and energy recovery. His background includes industrial wastewater treatment process design, community drinking water treatment systems, and industrial production, where he has worked as a shift supervisor. Additionally, he has been involved in learning about Recirculating Aquaculture Systems (RAS) projects.



Aritro has contributed as a researcher to the SPRING project, focusing on water treatment technologies, and is currently working on the ENFORCE project.

Estimated progress of the PhD project:

Just started ... < 50 % > 50 % Almost done ☺

Publications

1. *Role And Important Properties Of A Membrane With Its Recent Advancement In A Microbial Fuel Cell*, Banerjee A, Calay Rk, Eregno Fe .Energies. 2022;15(2). Doi:10.3390/En15020444
2. *Review On Material And Design Of Anode For Microbial Fuel Cell* Banerjee A, Calay Rk, Mustafa M, Energies. 2022;15(6):2283. Doi:10.3390/En15062283

