# Article information:

Insight in the behavior of bipolar membrane equipped carbon dioxide electrolyzers at low electrolyte flowrates - ScienceDirect
<https://www.sciencedirect.com/science/article/abs/pii/S1385894721027510?casa_token=MOK1B61vRskAAAAA%3APwamle_O7gFOQRHWE3fwd9z9Mv37iUCTc7omguBt9t3TyZhuwgT11w25BrElwc4_f9S1aUnR_w>

# Article summary:

1. Carbon capture and utilization (CCU) has gained interest as a measure to reduce CO2 emissions, with electrochemical reduction of CO2 (eCO2R) being a promising technology.

2. Gas diffusion electrodes (GDE) have been implemented in eCO2R electrolyzers to increase mass transfer and achieve current densities above 100 mA/cm2.

3. Bipolar membranes (BPMs) have potential in eCO2R electrolyzers due to their ability to prevent crossover and stabilize pH, but research is needed to understand their functioning at low catholyte flow rates where bulk pH can decrease.

# Article rating:

May be slightly imbalanced: The article presents the information in a generally reliable way, but there are minor points of consideration that could be explored further or claims that are not fully backed by appropriate evidence. Some perspectives may also be omitted, and you are encouraged to use the research topics section to explore the topic further.

# Article analysis:

The article titled "Insight in the behavior of bipolar membrane equipped carbon dioxide electrolyzers at low electrolyte flowrates" provides an overview of the electrochemical reduction of CO2 to formate/formic acid using bipolar membrane (BPM) equipped electrolyzers. The authors discuss the advantages and limitations of BPMs compared to other types of ion exchange membranes, such as cation exchange membranes (CEMs) and anion exchange membranes (AEMs), in terms of preventing crossover and stabilizing pH gradients in the different compartments of the reactor.

The article presents a comprehensive review of the literature on electrocatalysts for CO2 reduction, with a focus on formate/formic acid production. The authors highlight the importance of developing high-performance electrocatalysts that can operate at current densities above 100 mA/cm2 to make CO2 electrolysis industrially viable. They also discuss recent developments in reactor engineering, such as gas diffusion electrodes (GDEs), which allow gaseous CO2 to be fed directly into the cell, thereby increasing mass transfer and reaction rates.

The authors then turn their attention to BPMs and their potential use in eCO2R electrolyzers. They provide a detailed explanation of how BPMs work, including their ability to promote water splitting at the center junction and prevent crossover between compartments. The authors also discuss some of the challenges associated with using BPMs, such as increased energy consumption due to water dissociation and high ohmic resistance, as well as hydrogen evolution at the cathode due to the acidity of the cation exchange layer.

One potential bias in this article is its focus on formate/formic acid production as opposed to other products that can be obtained from eCO2R, such as carbon monoxide or C1/C2 products. While it is true that formate/formic acid has broad applications in various industries and is considered a promising energy carrier for direct formate fuel cells, it would have been useful for the authors to provide a more balanced discussion of all possible products from eCO2R.

Another limitation of this article is its narrow focus on low catholyte flow rates and how they affect pH gradients in BPM equipped electrolyzers. While this is certainly an important consideration for optimizing eCO2R performance, it would have been helpful for the authors to discuss other factors that can influence pH gradients, such as temperature, pressure, electrode materials, etc.

Overall, this article provides valuable insights into the behavior of BPM equipped electrolyzers for eCO2R. However, readers should be aware of its potential biases towards formate/formic acid production and its limited scope regarding pH gradients.

# Topics for further research:

* Factors influencing pH gradients in electrochemical CO2 reduction reactors
* Electrochemical reduction of CO2 to carbon monoxide or C1/C2 products
* High-performance electrocatalysts for CO2 reduction
* Gas diffusion electrodes for CO2 electrolysis
* Comparison of bipolar membranes with other types of ion exchange membranes
* Energy consumption and efficiency of bipolar membrane equipped electrolyzers

# Report location:

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