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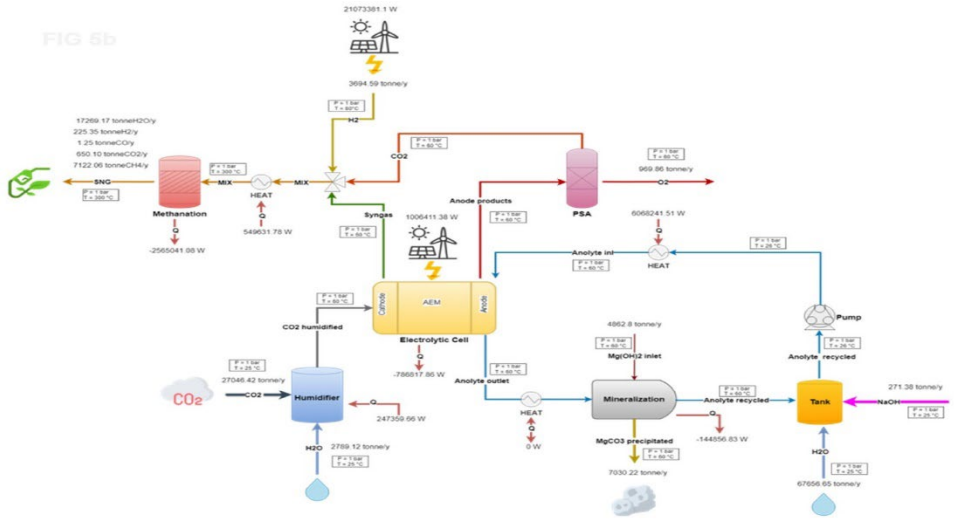
Licensing Opportunity

TTO – Technology Transfer Office

Co-generation of fuels and carbonates from CO_2 and H_2O co-electrolysis



Exemplary use cases and configurations of Synthetic Natural Gas production system.

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Keywords

CO2, electrolyser, AEM membrane, Synthetic Natural Gas

Intellectual Property

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Description

CO_2 electrolysis has garnered interest for its ability to produce low-carbon fuels using renewable energy. Traditional high-temperature electrolysis systems face challenges related to efficiency, durability, and cost. This invention introduces a water and carbon dioxide (CO_2) co-electrolyzer system aimed at enhancing the conversion of CO_2 into valuable products such as syngas (CO + H_2) and synthetic natural gas (SNG). The proposed system operates at low temperatures, leveraging an anion exchange membrane (AEM) electrolyzer. This design integrates a mineralization system to address the issues of bicarbonate and carbonate ion crossover, converting them into stable metal carbonates while simultaneously improving CO_2 conversion rates and energy efficiency.

Advantages

The invention offers improved CO_2 conversion efficiency and selectivity by using an AEM electrolyzer, which outperforms other membrane technologies in terms of stability and product yield. The integration of a mineralization system turns the drawback of ion crossover into a benefit by converting carbonates into stable forms, aiding in CO_2 storage and removal. This system is compatible with renewable energy sources, making it environmentally sustainable and cost-effective. It also provides operational flexibility due to its low-temperature design, avoiding the limitations of high-temperature electrolyzers such as fragility and complex thermal management. Additionally, the closed-loop design enhances durability and reduces operational costs, while the ability to recycle and replenish the anolyte ensures sustained performance.

Applications

- Conversion of CO_2 and water into syngas, a precursor for various fuels and chemicals.
- Production of synthetic natural gas (SNG) through integrated methanation systems.
- Capture and storage of CO_2 in the form of stable metal carbonates.
- Sustainable energy applications when coupled with renewable energy sources.
- Industrial deployment for low-carbon fuel production and carbon management solutions.