Advanced CO_2 or Water Electrolysis

Materials and Methods for Ultrathin Polymer Coated Catalyst with Enhanced Performance

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A thin, spray-applied polymer layer replaces thick membranes, reducing costs and enhancing scalability.

Prevents alkali metal transport and carbonate crossover, ensuring stable, efficient CO_2 electrolysis with minimal CO_2 loss.

Incorporating alkali metal salts suppresses unwanted reactions, improving performance and maintaining high current efficiency.

PCT application filed.

Collaboration opportunities: seeking research or licensing partnership.

Background

CO_2 electrolysis is a promising technology for converting carbon dioxide into valuable chemicals like carbon monoxide and hydrocarbons using electricity. Traditionally, this process involves a cathode catalyst, an anode catalyst in an alkaline electrolyte, and a commercial thick membrane to separate them. However, these thick membranes pose significant challenges. Cation exchange membranes lead to alkali metal transport from the anode to the cathode, causing salt formation and operational instability. Conversely, anion exchange membranes cause carbonate crossover, resulting in CO_2 loss, reduced selectivity, and decreased anolyte alkalinity.

Researchers at the University of Calgary addressed these issues by employing an ultrathin polymer coating, applied via a simple spray coating method, to cover the cathode catalyst. This approach eliminates the need for physical stand-alone thick membranes, reduces costs, and enhances scalability. By incorporating alkali metal salts into the ionomer composition, competing reactions are suppressed, improving selectivity, and ensuring stable, high-current operation for industrial-scale CO_2 electrolysis.

Competitive Advantages

- Eliminates the need for expensive, thick stand-alone membranes
- Simple spray coating method allows for large-scale application
- Reduces CO_2 loss and increases selectivity for desired products
- Prevents alkali metal transport and carbonate crossover, ensuring consistent performance

Areas of Application

- Converting industrial emissions into valuable chemicals
- Storing renewable energy as chemical fuels such as hydrogen
- Producing eco-friendly fuels from CO_2
- Recycling CO_2 into useful products

Publication and Resources

- Patent publication: WO2024086935A1
- Journal publication: Directly-Deposited Ultrathin Solid Polymer Electrolyte for Enhanced CO_2 Electrolysis
- Researcher Profile: Dr. Md Kibria
- Lab website: Department of Chemical and Petroleum Engineering

Interested in using this technology to help your business grow? Contact us!

ipm@innovatecalgary.com • 403.270.7027 • www.innovatecalgary.com