Advanced Saltwater Hydrolysis Methods and System

Tech ID: 32874 / UC Case 2022-833-0

BACKGROUND

Hydrogen is light, storable, energy-dense, and produces no direct emissions of pollutants or greenhouse gases. Hydrogen can be derived from several different resources, including fossil fuels, biomass, and water electrolysis with electricity. Electrolysis – the process of extracting oxygen and hydrogen out of water – is a promising option for carbon-free hydrogen production from renewable and carbon-free resources. The global shortage of freshwater limits its reasonable use for hydrogen generation by electrolysis. Seawater electrolysis was first discovered in the early 19th century. One major problem with seawater electrolysis is the formation of toxic constituents at the anode, such as chlorine, bromine, and further toxic byproducts. To first remove the dissolved salt from seawater (e.g. reverse osmosis) requires significant amounts of energy and capital. More recent approaches to hydrogen from seawater using membrane electrolyzers and/or catalytic electrode coatings can be complicated and expensive in addition to known durability and performance issues.

TECHNOLOGY DESCRIPTION

To overcome these challenges, researchers at UC Santa Cruz have developed cost-effective saltwater hydrolysis methods and system, featuring replenishable electrodes of certain geometry that are capable of safely sustaining a current density much higher than previously deemed practical, in support of a higher rate of hydrogen production on the cathode. The UC Santa Cruz approach leverages the higher conductivity environment of saltwater while avoiding concurrent generation of toxic byproducts such as hypochlorous acid, hypochlorite ions, and chlorine gas, and permitting reclamation of solid byproducts for recycling and or reuse.

APPLICATIONS

- saltwater hydrolysis for hydrogen production

ADVANTAGES

- cost-effective approach to saltwater hydrolysis
- potential for H2 yields higher than other methods
- no highly specialized membranes
- scalable and renewable-energy compatible

INTELLECTUAL PROPERTY INFORMATION

Country	Type	Number	Dated	Case
China	Issued Patent	202380055668.3	04/15/2025	2022-833

Additional Patent Pending

RELATED MATERIALS

- Explicitly controlling electrical current density overpowers the kinetics of the chlorine evolution reaction and increases the hydrogen production during seawater electrolysis - 11/29/2022

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OTHER INFORMATION

KEYWORDS

hydrogen, seawater electrolysis, electrolysis, green hydrogen, green H2, electrochemical water splitting

CATEGORIZED AS

- Energy
  - Hydrogen

RELATED CASES

2022-833-0

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