Self-Biased and Sustainable Microbial Electrohydrogenesis Device

Tech ID: 23430 / UC Case 2013-222-0

BACKGROUND

To employ energy-efficient processes for wastewater treatment while simultaneously recovering the energy contained as organic matter in wastewater would be incredibly beneficial to the environment. It has been demonstrated that utilizing microbial fuel cell (MFC) technology can generate energy, such as electricity. A MFC, or biological fuel cell, is a bioelectrochemical system that drives a current by mimicking bacterial interactions found in nature. These devices use electrogenic bacteria to oxidize organic matter and then transfer the electrons to an electrode to generate electrical energy. UCSC researchers have been pursuing methods to enhance, harness, and utilize the energy produced directly from the degradation of organic matter in a microbial fuel cell.

TECHNOLOGY DESCRIPTION

UCSC researchers have recently developed a self-biased and sustainable photoelectrochemical (PEC) microbial fuel cell hybrid device for electricity and hydrogen generation using wastewater and sunlight as the exclusive energy sources. The new PEC-MFC device provides photovoltage that enables microbial electrohydrogenesis to occur without the need of an additional electrical bias. The researchers have demonstrated the feasibility of continuous, self-sustained hydrogen gas production based solely on sunlight and biodegradable biomass recycling, by coupling solar water splitting and microbial electrohydrogenesis in a PEC-MFC device assembly. The results provide new insights into the development of efficient energy solutions by integrating solar and microbial technology, which may revolutionize the conventional wastewater treatment methods currently applied nationwide. This invention has the potential to disrupt existing process systems and create new fields of use.

APPLICATIONS

- Sustainable energy
- Wastewater treatment

ADVANTAGES

- Efficiently generates sustainable energy
- A practical solution to wastewater treatment

RELATED MATERIALS

- News Article: New device achieves self-biased solar hydrogen generation through microbial electrohydrogenesis at lab scale - 10/10/2013
- Journal Publication: Self-Biased Solar-Microbial Device for Sustainable Hydrogen Generation - 09/11/2013

INTELLECTUAL PROPERTY INFORMATION

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,825,321	11/21/2017	2013-222

Additional Patent Pending

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INVENTORS

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OTHER INFORMATION

KEYWORDS

Electricity, microbial, sunlight, PEC, MEC, sustainable, waste, waste treatment, electrohydrogenesis, water splitting, hydrogen, energy, sustainable energy, energy efficient, solar, biotechnology, environment, bioenergy

CATEGORIZED AS

- **Agriculture & Animal Science**
  - Other
- **Biotechnology**
  - Industrial/ Energy
- **Energy**
  - Bioenergy
  - Solar
- **Environment**
  - Other

RELATED CASES

2013-222-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Carbon-Doped NiO Catalyst For Hydrogen Evolution Reaction
- Zinc-Iodine Battery with improved Coulombic efficiency
- Controlled And Uniform Electrodeposition Of Manganese Dioxide On 3D Porous Scaffolds
- Z-Scheme Microbial Photoelectrochemical System (Mps) For Wastewater-To-Chemical Fuel Conversion
- Hydrogen-Treated Semiconductor Metal Oxides For Photoelectrochemical (PEC) Water Splitting
- Three-Dimensional Hierarchical Porous Carbon Foams For Supercapcitors

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