

Non-Confidential Description - PSU No. 3894 "Hydrogen Gas Production Using Waste Heat Regenerated Salt Solutions"

Keywords:

Reverse electro dialysis, hydrogen gas, waste heat recovery, heat regenerated salt

Links:

[Inventor Website](#)
[Published US Patent Application](#)

Inventors:

Bruce Logan

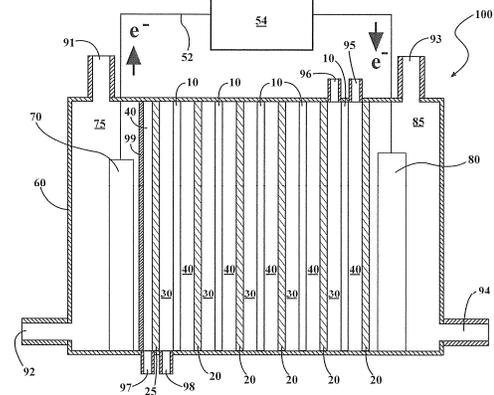


Diagram of reverse electro dialysis system

Background

Development of renewable energy has become increasingly important as concerns about carbon-based fuels grow, creating a growing need for the stable production of hydrogen gas. It has been shown that a reverse electro dialysis stack (RED) inserted between the electrodes of a microbial fuel cell can produce hydrogen gas. However, there is currently no method for using a system for hydrogen production in the absence of microbial oxidation of organic matter at the anode. Previous systems without microbial oxidation of organic matter have been designed for electrical power production, rather than hydrogen gas production.

Invention Description

The proposed invention describes a process for producing hydrogen gas at the cathode and oxygen at the anode of an electrochemical device consisting of a stack of reverse electro dialysis membranes that use a heat regenerated salt (ammonium bicarbonate) to generate a salinity gradient. Ammonium bicarbonate and water are separated into high concentration and low concentration streams using distillation. These streams are then fed into a reverse electro dialysis stack between membranes. With enough membranes an electrochemical potential is generated that is able to split water at the anode, thus producing oxygen. The current is then transferred to the cathode for hydrogen production. This method provides pure hydrogen gas that avoids the problem of membrane fouling due to the heat regenerated solution.

Advantages/Applications

- Uses a heat regenerated salt to generate hydrogen gas
- Uses reverse electro dialysis stacks between membranes
- Avoids membrane fouling
- Can be used in Chlorine gas production

Contact: Bradley A. Swope
Sr. Technology Licensing Officer
The Pennsylvania State University

Phone: (814) 863-5987
Fax: (814) 865-3591
E-mail: bradswope@psu.edu

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