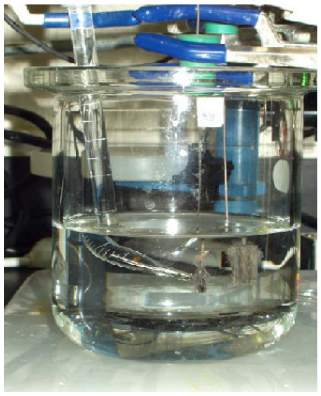
ELECTROLYSIS OF ETHANOL FOR FUEL CELL APPLICATIONS

TECHNOLOGY OVERVIEW



Ethanol is a major source of low-cost renewable biofuels, and is becoming a popular alternative in replacing several conventional sources of energy. The technology provides an improved mechanism for the oxidation of ethanol in alkali solutions. Researchers have designed a bimetallic anode composed of Platinum (Pt) and Rhodium (Rh), which increases the oxidation rate of ethanol to make it more suitable for use in fuel cells. It eliminates drawbacks faced by previous methods such as incomplete oxidation and the production of several by-products. Ethanol is emerging as one of the most promising materials to be used in fuel cells due to convenience in storage, reduced environmental impact and versatile nature. The invention will provide a means to commercialize ethanol fuel cells by removing the various shortcomings faced in existing oxidation procedures. The adjoining diagram shows the testing of the elctro-oxidation activity of the Pt-Rh anode.

POTENTIAL FIELDS OF USE

The technology has several commercial and environmental benefits. The US Environment Protection Agency (EPA) has been very active in promoting the use of bio-fuel cells that could help to control of greenhouse effect by reducing emissions substantially. Automobile manufacturers like Honda and Ford have already launched ethanol powered cars and several others are looking at exploring this opportunity in the near future. The technology can also have applications the area of consumer electronics to run portable devices such as cellular phones and notebook computers. The annual demand for renewable fuel is expected to reach 5 billion gallons by 2012 and save the total US households $51.7 billion in fuel expenses. The fuel cell market is currently experiencing a rapid 70% annual growth, and is projected to grow to more than $18.5 billion by 2013. There is heavy investment in the future of ethanol fuel cells by the government and industrial sector alike.

BENEFIT ANALYSIS

Ethanol fuel cells are convenient to transport and store, and are cheaper than gasoline alternatives. The proposed technology provides a number of key benefits over existing models:

- Increase in the ethanol electro-oxidation activity of Pt on carbon fiber catalysts by the addition of Rh.
- Temperature independent nature of the process.
- Facilitates commercial application of ethanol fuel cells against other renewable sources of energy.
- Eliminates the production of several toxic by-products, helping in the control of greenhouse gases in the atmosphere.

STAGE OF DEVELOPMENT

The desirable conditions for total oxidation of the ethanol to CO2 were evaluated. Rh was verified as a feasible catalyst for ethanol oxidation of alkaline media. Extensive studies were performed to evaluate various catalyst anodes to determine the optimal combination of a bimetallic Pt-Rh anode. Electrochemical techniques and computational chemistry were used to assess the electrolysis of ethanol for various Pt-Metal combinations.

FUTURE DEVEOPMENT

Future efforts will be concentrated on testing the performance of the Pt-Rh electrode under varying conditions to verify its suitability to commercial manufacturing and application on a larger scale.

LICENSING OPPORTUNITIES

A patent for the technology is pending. Licensing opportunities are available.

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