

NOVEL COMPOSITE MEMBRANE FOR PEM FUEL CELLS AND DIRECT FUEL CELLS

Technology Overview

The technology deals with the modification of electrolyte membranes to create a composite material to increase the durability and effectiveness of fuel cells. For example, a composite material blended with Nafion exhibits greater thermal and mechanical stability over materials in comparable membranes. The thermal stability of the membrane reduces the complexity of proton conducting membranes within fuel cells, which improve as temperatures increase. Additionally, this technology reduces the fuel crossover that extends membranes stability for long-term cell efficiency. Furthermore, this composite offers to increase the cell operating temperature and controls the membrane swelling compared to neat polymers.

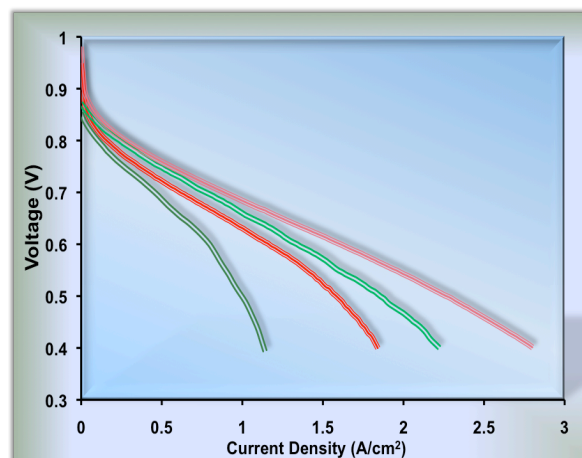


Figure: Performance of Nafion-composite and neat Nafion polymer single cells operated on H₂/O₂ at 80/80/80 °C and 100/100/100 °C of T cell/T cathode humidity/T anode

Potential Fields of Use

The target market for this invention is the advanced materials industry with a focus on energy. While there is interest in new materials such as polyphosphazenes, Nafion is still the material of choice for membranes, and this technology alleviates some of Nafion's shortcomings while retaining its advantages. Currently, 90% of Nafion sales go to the global electrolysis industry, of which fuel cells are just one segment. Utilities in India and China buy thousands of square meters of the material, and the market is growing. In 2008, DuPont's Electronics division, which includes fuel cells, recorded \$4 billion in revenue.

Benefit Analysis

- Controlled membrane swelling
- Improved mechanical stability
- No penalty on ion conductivity
- Improved thermal stability

Stage of Development

Laboratory scale production of samples is available for testing.

Future Development

The technology is ready for industrial scale deployment in membrane applications.

Licensing Opportunities

A patent application for this technology has been filed. Licensing opportunities are available.

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