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Aluminum and Solid Alkali Peroxide Galvanic Cell — A New Efficient Design

Researchers at the University of South Florida have developed a novel galvanic power cell that can release more electrochemical energy than current fuel cells.

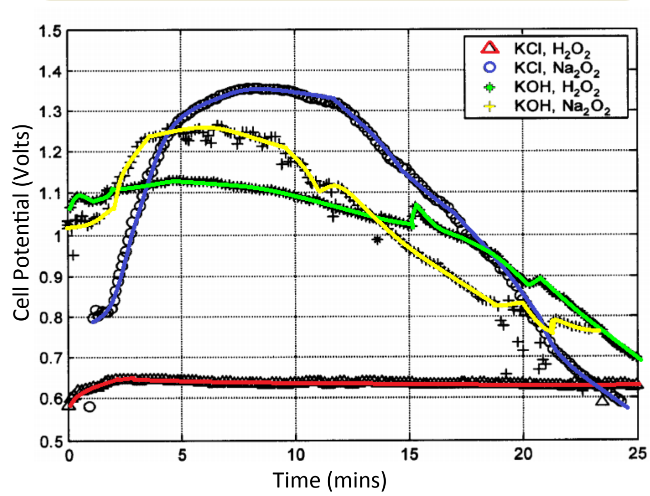
Galvanic cells with an aluminum anode are highly desirable as an energy source because of their high theoretical energy densities. However, current aluminum anode galvanic cell designs do not take the relative area of the anode and cathode into account for the cell performance. In current cells the excess anode area leads to additional consumption of the aluminum anode by parasitic reactions, thus reducing anode efficiency. Additionally, current cells which use a hydrogen peroxide cathode reaction do not have efficient cathode reactions, which is a major obstacle in designing high performance galvanic cells.

Our inventors created a novel galvanic cell with an aluminum anode and a cathode compartment design suitable for carrying out the aqueous electrochemical reaction between solid aluminum metal and aqueous peroxide ion. In this cell, sodium peroxide replaces the hydrogen peroxide, which improves the cathode reaction efficacy. The galvanic cell is activated when water, aqueous hydroxide solution, or an aqueous salt solution is added to the cell. This reaction releases a significant amount of electrochemical energy from a small size cell. This cell reaction and design leads to an improvement in energy released over state-of-the-art aluminum/hydrogen peroxide galvanic cells. This invention could be used to develop improved batteries and fuel cells for a wide range of applications.

ADVANTAGES:

- More efficient energy gain from anodes
- Improved power delivery from cell
- Higher energy output relative to losses from parasitic reactions
- Additional control of cathode

Significant Electrochemical Energy Release from a Small Cell



Cell Potential Higher with Sodium Peroxide (Na_2O_2) Cathode Vs Hydrogen Peroxide (H_2O_2) Cathode

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