

Oil Displacement System to Mitigate Open-circuit Corrosion in Metal-air and Metal-seawater Batteries

Technology #18627

Applications

Metal-air batteries can be used in a variety of applications ranging from range extenders for electric vehicles to emergency power systems. Metal-seawater batteries are primarily used for underwater applications ranging from torpedoes to underwater unmanned vehicles.

Problem Addressed

Metal-air/seawater batteries have high gravimetric energy densities; however, open-circuit (OC) anode corrosion causes severe capacity fade when the battery is shut off. Previous technologies focus on chemical mitigation methods (i.e. changing electrode or electrolyte composition), which provide insufficient corrosion mitigation and power density. Other mechanical corrosion mitigation methods require flushing the cell, which increases the volume of tanks required for the system. The proposed technology implements a system that displaces the electrolyte with oil when the battery is off to prevent OC corrosion.

Technology

The main elements of the system include a metal-air cell, a tank of mineral oil and electrolyte, and a separate tank of water. Pumps and pipes move liquids between these three parts. The device displaces corrosive electrolyte from the anode surface by pumping oil into the cell. In comparison to other mechanical corrosion mitigation methods, this oil displacement method increases volumetric energy density by 15%. Additionally, a liquid that has a different density than the electrolyte, is immiscible in the electrolyte, non-conducting, inviscid, and nonreactive with the other system components could replace the oil in this system.

Advantages

- Decreases anode corrosion in metal-air batteries
- Enables high power density and frequent, prolonged battery shut-offs

Categories For This Invention:

Energy

Electric Vehicles

Energy Storage

Batteries

Metal-Air Batteries

Other (Batteries)

Transportation

Other (Transportation)

Intellectual Property:

Oil displacement system to mitigate open-circuit corrosion in metal-seawater batteries

US Patent Pending

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Corrosion mitigation in metal-air batteries

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Hatsopoulos Microfluids Laboratory

<http://web.mit.edu/hml/HML.html>

Electromechanical Energy Lab

<http://web.mit.edu/eel/>