TECHNOLOGY

Multiple-Electron Aqueous Battery

OVERVIEW

Background

The adoption of Hybrids, Plug-In Hybrid, and Battery Electric Vehicles has grown significantly over the past years. Despite this growth in adoption, electric vehicles progression has been relatively stagnant due to the high cost and range of the large format automotive batteries. The ideal benchmarks these batteries requirement to need is an energy density high enough for a 300 mile –range per charge, cost less than $100/kW, and be robust enough to against road conditions while remaining safe. The current solution in industry is the use of lithium-ion batteries despite providing the highest energy density available amongst other rechargeable battery technology available today. Lithium-ion batteries are relatively expensive as well as hazardous due to electrolyte failure. To prevent catastrophic thermal runaway, battery management systems using thermal and electronic control on both cell and pack levels have to be employed, which not only increases the cost and but also reduces the overall device energy density of lithium battery. Alternatives such as solid state lithium-ion and alkaline nickel /metal – hydride batteries are safe but fail to provide an ideal energy density.

Innovation

Researchers at the University of Maryland have developed a design of a 2.5V multiple electron aqueous battery that satisfies the ideal metrics desired of large format automotive batteries for electric vehicles. The theoretical energy density of the multiple electron aqueous battery design is 2 times higher than the theoretical energy density of non-aqueous LiCoO2/Graphite Li-ion batteries. This battery will be fundamentally safe and cheaper due to the thermal runaway hazard being essentially eliminated with the use of an aqueous electrolyte and the absence of battery management system. The proposed design will offer improved robustness including mechanical abuse tolerance due to hybridization of two distinct battery chemistries.

APPLICATIONS

Electric Vehicles
Mass Energy Storage

ADVANTAGES

No battery management system
High energy density
Intrinsically safe
Low Cost

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Additional Information

INSTITUTION

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CATEGORIES

- Power Electronics
- Chemical

EXTERNAL RESOURCES

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