Georgia Tech
Technology
Licensing

https://licensing.research.gatech.edu
techlicensing@gatech.edu
770.658.8820

GT Ref: 8700

Host Material for Rechargeable Zinc Anodes in Aqueous Batteries

Category: Energy Storage and Battery Technology

Contact: Ben DeGreen Phone: 404.894.4739

Summary

This innovative electrochemical cell technology leverages a conductive host material specifically designed to facilitate dendrite-free zinc metal deposition. This approach significantly enhances the rechargeability and utilization of zinc anodes in aqueous batteries by optimizing the deposition process. The technology aims to improve the structural integrity and performance of zinc anodes, which are crucial for extending the life and efficiency of batteries in various applications, particularly those requiring high reliability and sustainability.

Development Stage

Prototype and First Operational Test Complete

Problem Statement & Solution

With the rise of portable electronics and advancements in vehicle electrification and smart grids, there is a growing need for sustainable, safe, and high-capacity energy storage systems. Traditional lithium-based batteries pose significant environmental and safety challenges, including toxicity and the potential for ecological harm. In the realm of zinc anodes used in aqueous batteries, the industry faces critical issues such as dendrite formation that can lead to short circuits and battery failures. Moreover, these batteries often suffer from low active material utilization and uneven voltage distribution, which further exacerbates problems like zinc salt precipitation and dendrite growth, compromising battery performance and longevity.

Researchers at the Georgia Institute of Technology have developed a new electrochemical cell technology to address these challenges. By leveraging a conductive host material specifically designed for dendrite-free zinc metal deposition, this invention not only enhances the rechargeability and utilization of zinc anodes but also significantly improves the structural integrity and performance of batteries, offering a safer and more sustainable alternative to lithium-based options.

Advantages

- Substantially dendrite-free zinc metal deposition.
- High percentage of active material utilization (at least 50%).
- Compatibility with various zinc-alloying metals and conductive host materials including chemically expanded graphene or graphite, metal foam, and conductive polymers.
- Improved safety and environmental friendliness due to aqueous electrolyte usage.
- Potential for high capacity from 1 mAh/cm2 to 200 mAh/cm2.

Commercial Applications

- Large-scale energy storage systems for portable electronics, vehicle electrification, and smart grids.

- Commercial zinc-ion batteries for various applications requiring high safety and environmental standards.
- Advanced battery technologies for sustainable and eco-friendly energy solutions.

Lead Inventor: Nian Liu, PhD

Intellectual Property Status: US Patent Filed- WO2023150204A2

Scientific Publication(s): Wu, T. -H., Liu, N., et. al:, (2019). Nanoscale design of zinc anodes for high-energy aqueous rechargeable batteries. *Materials Today Nano, 6, 10032.*