

High Energy Li Batteries with Lean Lithium Metal Anodes and Methods for Prelithiation

This technology offers a rechargeable, full lithium metal battery cell with superior stability. This system is composed of lithium metal anode with a carbon-coated copper current collector that is prelithiated (deposited).

What is the Problem?

Current lithium battery technology consists of non-rechargeable lithium metal batteries or rechargeable lithium-ion batteries; both are used to power various devices depending on whether rechargeability is desired. With ever-increasing societal energy consumption due to consumer electronics, electric vehicles, and data centers, conventional rechargeable batteries are no longer sufficient, and more efficient rechargeable battery technology is in high demand. Rechargeable lithium metal batteries, which have ten-fold the energy capacity of lithium-ion batteries, may be able to meet society's growing energy needs. However, rechargeable lithium metal batteries are less stable than lithium-ion batteries because lithium metal may form branch-like structures called "dendrites," damaging the battery which leads to a shorter battery life, and potentially creating safety hazards for end-users.

What is the Solution?

The solution is a rechargeable, full lithium metal battery cell that avoids lithium dendrite formation while exhibiting good performance. This rechargeable lithium metal battery improves the performance and stability of the lithium metal anode. The lithium metal anode consists of a carbon-coated copper current collector with the carbon coating prelithiated (deposited), with lithium metal. The method of prelithiating the carbon coating on the collector is defined. This full lithium metal battery cell that incorporates the prelithiated carbon anode can sustain roughly the same discharge capacity for at least 50 charge cycles.

What Differentiates it from Solutions Available Today?

Current solutions are lithium-ion batteries, which have a small capacity. Emerging solutions of lithium metal batteries have suffered from instability issues, limiting adoption. The performance of this solution is greater than those of similar battery cells incorporating a conventional copper anode or a pure lithium anode, while offering superior stability.

Patent Information:

Technology ID

BDP 8167

Category

Selection of Available
Technologies
Cleantech/Energy
Storage/Batteries

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References

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