Lithium Anode Protective Layers for Li-air Batteries
Technology #16045

Applications

This technology is relevant to high energy density batteries, such as for electrical vehicles.

Problem Addressed

Lithium-air batteries can have energy densities that rival gasoline. However, the lithium-air chemistry can be difficult to manage, making the cycle life much shorter than conventional lithium-ion batteries. This technology increases lithium-air cycle life by protecting the lithium anode from dendrite growth.

Technology

Current lithium-air battery designs place a polymer separator directly in contact with the lithium anode to separate the anode and cathode sides of the battery. The separator prevents the battery from short circuiting and absorbs liquid electrolyte to complete the electrical circuit. The lithium anode, however, can form dendrites during battery cycling that can penetrate the separator and short the battery. This technology modifies commercially available polymer separator membranes with ion-conductive polymer and graphene oxide layers. The ion-conductive polymer layers reduce direct contact between the electrolyte and the lithium anode without significantly reducing ion conductivity. This slows electrolyte corrosion on the anode. The graphene oxide layers protects the anode from contaminants and prevent chemical fluctuations on the surface of the lithium anode. Together, these two types of layers stabilizes the lithium anode, which slows down the growth of lithium dendrites and improves the battery's cycle-life.

Advantages

- Increases cycle life of lithium-air batteries
- Simple and universal synthesis method
- Compatible with current commercial polymer membranes separators

Categories For This Invention:

Energy
Energy Storage
Batteries
Lithium Batteries
Metal-Air Batteries

Intellectual Property:
Multi-layer structures prepared by layer-by-layer assembly
US Patent Pending
2014-0186724

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Publications:
Li-Anode Protective Layers for Li Rechargeable Batteries via Layer-by-Layer Approaches
Chemistry of Materials
March 24, 2014

External Links:
The Hammond Lab
https://hammondlab.mit.edu/

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