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3D-Soft Electrode for Li-Chalcogen Batteries

3D-Soft Electrode for Li-Metal Batteries

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Background

Due to their high theoretical current density, Li-Air, Li-sulfur, and Li-selenium batteries have attracted a great deal of attention. Their high energy density, which can be two orders of magnitude greater than current lithium ion batteries, makes them ideal for applications ranging from automotive locomotion to grid scale energy storage. However, dendritic growth of lithium has rendered these promising batteries unsafe and unreliable. Lithium dendrites are stochastic growths of lithium metal which decrease conductivity, diminish longevity, and increase the likelihood of a short circuit. Therefore, for these high energy batteries to be useful commercially, a method that minimizes dendritic growth is needed.

Invention Description

Researchers at ASU have developed novel soft electrodes for lithium anode for lithium-metal based batteries. Excitingly, these soft electrodes do not form lithium dendrites even when operating under high current densities. Additionally, researchers at ASU have shown that these electrodes retain an impressive Coulombic efficiency of more than 99.5% even after one hundred cycles. This significantly outperforms typical copper electrodes which begin to decay after only 10 cycles. Furthermore, the synthetic methodologies used to develop these electrodes are conventional and cost-effective. This invention is expected to have major impacts on the development of metallic electrodes for nextgeneration, ultrahigh capacity battery systems such as Li-sulfur and Li-air batteries.

Potential Applications

- Grid Scale Batteries
- Automotive Batteries
- Portable Electronics

Benefits and Advantages

- Enduring – Because the soft electrode design limits the formation of lithium dendrites the Li-metal-based battery has a significantly longer lifetime.

- Safe – Limited dendritic growth reduces the possibility of short circuiting.
- Powerful - Lithium-air batteries have a much higher energy density than lithium ion batteries.

For more information about the inventor(s) and their research, please see

[Dr. Hanqing Jiang's Directory Page](#)