**Research on Lithium Battery Anti-Crystallization Based on Electron Flow System**

**Abstract**

During long-term use, lithium-ion batteries tend to form lithium plating on the surface of the anode, leading to reduced battery life, capacity degradation, and even safety hazards. This study proposes a novel approach utilizing an internal electron flow system to improve lithium-ion circulation and mitigate the formation of lithium plating.

**1. Introduction**

With the widespread adoption of lithium-ion batteries in electric vehicles and portable electronics, the problem of lithium-ion deposition on the anode surface has become increasingly significant. The traditional approach to mitigating lithium plating involves optimizing charging algorithms and temperature control. However, these methods have limitations, especially under high-power charging conditions.

This paper introduces an **internal electron flow system**, which enhances the movement of lithium ions within the electrolyte, thereby reducing the risk of localized ion congestion and lithium plating formation.

**2. Theoretical Analysis**

Lithium plating typically occurs when excessive lithium ions accumulate at the anode surface, especially under fast-charging conditions. This is primarily due to the imbalance between lithium-ion diffusion and electron transport. The presence of high concentrations of lithium ions at the anode surface leads to uncontrolled deposition, forming dendrites that penetrate the separator and cause battery failure.

The **electron flow system** aims to address this issue by:

* Creating a controlled directional flow of electrons within the electrolyte.
* Preventing excessive lithium-ion accumulation at the anode.
* Ensuring uniform ion distribution across the anode surface.

**2.1 Structure of the Electron Flow System**

Instead of allowing free movement of lithium ions in a static electrolyte, this system introduces a **guided flow pathway** that:

* Directs electrons and lithium ions along predefined routes.
* Uses internal conductive structures to improve charge distribution.
* Enhances electrolyte circulation to prevent localized ion buildup.

**3. Experimental Approach**

To validate the feasibility of this method, simulations and experimental setups will focus on:

* Comparing lithium plating rates in conventional vs. flow-assisted lithium-ion batteries.
* Measuring charge/discharge efficiency improvements.
* Analyzing the structural integrity of the anode after multiple charging cycles.

**4. Expected Outcomes**

By implementing an electron flow system, we expect to:

* Extend battery lifespan by reducing lithium plating.
* Improve the efficiency of high-power charging.
* Enhance overall battery safety by mitigating dendrite formation.

**5. Conclusion**

This study presents a potential breakthrough in lithium-ion battery technology by addressing one of the most critical factors affecting battery degradation. The proposed electron flow system offers a novel way to manage ion distribution, ensuring a longer-lasting and safer battery system.