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Institute of Energy and Climate Research
Ionics in Energy Storage (IEK-12)

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Enhance Battery Performance: Innovative Method for Preconditioning Electrodes in Alkali-Ion Batteries

Technology Description

The invention offers a cost-effective and reproducible method for producing electrodes with improved electrical properties for alkali-ion based batteries. The method includes providing a preloaded electrode layer with alkali ions and contacting the preloaded electrode layer with a solution containing an organic solvent and at least one dissolved additive. The additive can be selected from carbon dioxide, organic carbonates, organic silanes, their derivatives, or mixtures of at least two additives from this group. The method aims to improve the electrical properties of the electrode.

Problem

The success of electronic consumer goods, such as smartphones, laptops, and electric vehicles, relies on reliable and long-lasting battery performance. Efforts are being made to enhance the electrical performance, durability, and cost-effectiveness of rechargeable batteries. Alkali-ion batteries, particularly lithium-ion-based cells, offer high energy density and practical lifespan. However, there is room for improvement in terms of cycle stability and specific capacity of preloaded electrode layers in alkali-ion cells.

Solution

The present invention provides a method for treating preloaded electrode layers to enhance their electrical properties. By contacting the preloaded electrode layer with a solution containing specific additives in a non-electrolyte environment, the treated electrodes exhibit improved electrical behaviour during battery operation. The patented method is reproducible, cost-effective, and compatible with various preloading techniques. The modified preloaded electrodes demonstrate enhanced cycle stability and initial capacity.

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Contact
Scientific Contact
Prof. Dr. Egbert Figgemeier

Innovation Manager
Dr. Jörg Bohnemann

Keywords: Li-ion batteries, prelithiation, battery capacity, energy density, Solid Electrolyte Interphase, SEI

More Information
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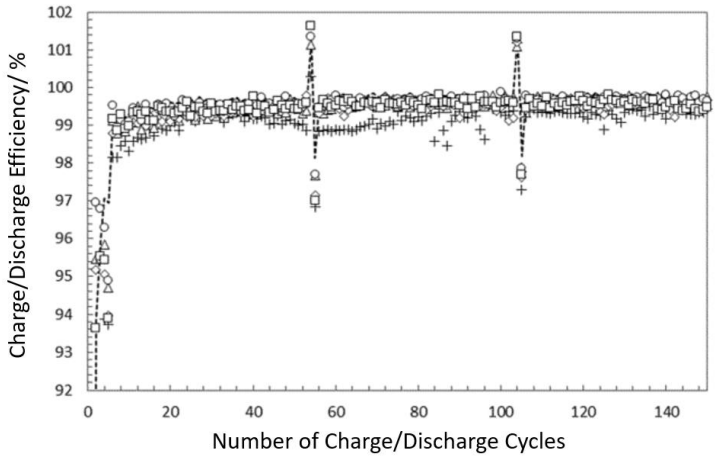

Potential Use

The method is suitable for producing electrodes for alkali-ion accumulators, such as lithium-ion batteries. The treated preloaded electrodes can be used in battery cell assemblies, leading to improved long-term stability, and increased specific discharge capacity. The method offers the potential for higher electrical performance over an extended period and increased Coulombic efficiency in battery systems.

Development Status and Next Steps

Forschungszentrum Jülich has extensive expertise in this field and holds several patents. The technology described above has already been initially verified through prototypes and is continuously being developed further. The Institute of Energy and Climate Research (IEK-12) – Ionics in Energy Storage – already cooperates with numerous national and international companies and scientific partners. Forschungszentrum Jülich focuses on energy and cost-efficient devices, suitable for various emerging technologies. We are continuously seeking for cooperation partners and/or licensees in this and adjacent areas of research and applications.

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