

Novel polymer coating for improved cycling stability of solid-state lithium ion batteries



Lithium-ion battery, polymer, electric vehicles, electronics, solid-state batteries, energy storage, secondary battery, coating of electrodes

DESCRIPTION OF TECHNOLOGY

Batteries are indispensable in today's world. They are used in electric vehicles and electronic devices, and are needed for many renewable energy storage solutions. However, due to cell degradation, they gradually lose capacity during usage. Ways for improving life-cycle stability are therefore urgently needed.

This invention presents a novel polymer-coating which can be easily applied via spray-coating to form homogenous polymer layers on electrode materials, resp. electrodes, which are reducing cell degradation and thus improve the long-term



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stability by increasing the number of achievable recharge-cycles of batteries.

The novel polymer-coating is based on polycationic or polyanionic polymers instead of neutral polymers which are already applied within state of the art. While neutral polymers can cushion mechanical stress between the granula of an electrode material they also isolate the granula from each other, thus reducing or even preventing the required flow of electricity.

The polycationic, resp. polyanionic, polymers presented herein exert intrinsic electric conductivity and therefore do not inhibit the flow of electricity between the granula, resp. inhibit only to a much lesser degree than neutral polymers do. Thus, reduction of mechanical stress by polymeric cushioning is achieved with only negligible loss of electric conductivity.

AT A GLANCE ...

Application Fields

- Rechargeable Lithium-ion Batteries

Business

- Battery manufacturer
- Chemical industry
- Automobile industry
- Renewable energy storage

USP

- Reduced interfacial degradation
- Improved long-term stability
- Improvement of Battery performance
- Easily applicable via spray-coating with polymer solution

Development Status

- Functionality is proven on laboratory scale

Patent Status

Priority application filed on Sept. 30th 2022 at the EPO; subsequent PCT application filed on Sept. 29th 2023.

APPLICATION FIELDS

Preferred area of application of the invention is manufacturing of solid-state lithium ion batteries, due to their prevalent usage in nearly all areas where storage of electric energy with high energy density and safety is required.

The basic principle is applicable to other types of batteries also, so that nearly all kinds of solid state batteries may gain better performance by use of the polymer coating. Especially batteries for electric vehicles and applications for intermediate storage of renewable energy in order to ensure grid stability may benefit most from the new coating.

ADVANTAGES OVER THE PRIOR ART

The polymer coating with polycationic or polyanionic polymers reduces interfacial degradation and thereby improves the long-term stability and performance of solid state batteries, especially Lithium ion batteries, thus further pushing their broad applicability.

Because the coating can be easily done by spray-coating, it provides a versatile low-cost and high-throughput manufacturing which requires only minor adaptations of existing production processes.

STATE OF PRODUCT DEVELOPMENT

Produkt development is currently still on an early stage. First electrochemical evaluations with solid-state batteries have been performed under laboratory conditions and show significant performance improvements.

MARKET POTENTIAL

The growing demand and need for electronic energy storage solutions with the transition to renewable energies and the increase in electric vehicles, provides a continuously growing and attractive future-oriented market.

COOPERATION OPPORTUNITIES

On behalf of Justus-Liebig-University Giessen, TransMIT GmbH is looking for cooperation partners or licensees worldwide.

A TECHNOLOGY OF



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