

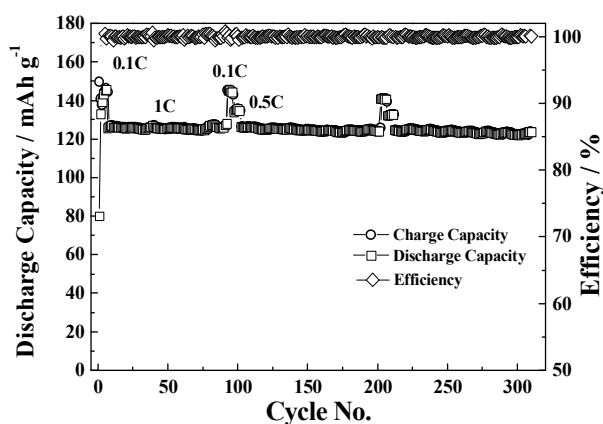
EPAP

Corrosion prevention in NMC-cathodes for lithium-ion batteries

Invention

The presented technology enables a water-based processing for the fabrication of composite electrodes, comprising, for instance, $\text{Li}[\text{Ni}_{1/3}\text{Mn}_{1/3}\text{Co}_{1/3}]\text{O}_2$ (NMC) as active material. Usually, the active material is mixed with a solvent and a binder to obtain a slurry which is cast on a metal foil, e.g., aluminum, serving as current collector. The use of water as dispersion medium, instead of an organic solvent, and a natural binder from the cellulose family allows for a non-toxic and cheap process and is therefore highly desirable. Up to now, a drawback of this approach has been the leaching of metals from the active materials and the corrosion of the aluminum foil due to an increase of the pH-value. As described in the herewith offered patent, this can be prevented by adding a mild inorganic acid to the slurry, while the addition of other acids, even organic acids such as formic acid, show, in fact, a detrimental effect on the electrochemical performance of such cathodes by favoring the leaching of the metals.

The use of the mild inorganic acid as an additive for the preparation of electrodes is a cheap way to improve the cycling stability and capacity retention of lithium-ion batteries. The easily up-scalable water-based processing avoids the use of harmful solvents like N-methylpyrrolidone and allows for the use of environmentally friendly binders like carboxymethyl cellulose, which enable a facile recycling of the battery after use.



Cycling performance of a Li-ion full-cell, based on aqueous-processed electrodes (cathode: NMC; anode: graphite), comprising CMC as binder.

Further improvement is currently under development. PROVendis offers licenses for this invention to interested companies on behalf of the University of Muenster, Germany.

Current Status

The patent application for this technology was filed at the German Patent Office (DPMA). A PCT application was also filed. These applications are not disclosed, yet. A further detailed description of the invention and scientific results can be provided on request.

An invention of the University of Muenster (WWU Münster).

Competitive Advantages

- Enables water-based electrode preparation
- Cheap and simple process
- Improved cycling stability of lithium-ion batteries

Commercial Opportunities

Future electro-mobility concepts require advanced battery technologies. Main drawbacks today are restrictions in energy density, cycling stability, and cost. The presented invention provides a solution that helps to overcome these problems. Extensive laboratory tests have already demonstrated the advantages of the invented process for preparing lithium-ion battery electrodes.

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