MOSI ANTI-FADING ELECTROLYTE ADDITIVES - FOR HIGH VOLTAGE APPLICATION IN LITHIUM ION BATTERIES

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HINTERGRUND

Previous studies have shown that electrolyte additives based on metals and semimetals (LiBOB, Mg(TFSI)2, Al(TFSI)3) as well as additives containing trimethylsiloxyl (TMS) groups as ligands can have positive impact on the cycling performance of lithium ion battery cells due to solid electrolyte interphase (SEI) and/or cathode electrolyte interphase (CEI) film forming properties and/or scavenging properties towards acidic impurities.

PROBLEMSTELLUNG

Enhancing the performance of lithium ion batteries

LÖSUNG

This technology combines these active functionalities (metal core and trialkylsiloxy based ligands) into one using Al, Ti and B as metal cores combined with TMS ligands (M(TMS)x). All M(TMS)x additives were able to improve the cycling performance regarding Coulombic efficiency, energy efficiency and capacity retention of LiNi1/3Co1/3Mn1/3O2(NCM111)/Li half-cells and NCM111/graphite full-cells at high potentials (>4.3 V vs. Li/Li+). The formed CEI was studied by means of electrochemical impedance spectroscopy, scanning electron microscopy and X-ray photoelectron spectroscopy. The obtained results indicate that the investigated additives are either actively incorporated into the formed CEI layer (in case of Al, Ti as metal core) or interacting with decomposition products (in case of B as metal core) resulting in lower charge-transfer impedance and hence improved long-term cycling behavior.

The results of LIB full-cells show a twofold cycle life compared to the standard electrolyte. The addition of the M(TMS)x based additives lowers the charge transfer impedance during prolonged cycling. MOSi leads to lithium ion batteries with enhanced anti fading performance.

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ENTWICKLUNGSSTAND

Prototyp

PATENTSITUATION

DE anhängig

CATEGORIES

//Energietechnik //Life Sciences //Chemie

VORTEILE

- TMS Complex of titanium, aluminum or boron for high voltage cells
- Suppress the capacity fade at potential of up to 4.6 V vs. Li/Li+
- LIB full-cells show more than a twofold cycle life compared to the standard electrolyte
- Increase the energy efficiency of LiNi1/3Co1/3Mn1/3O2
- Reduce the presence of electrolyte decomposition products in the electrolyte, mainly LiF
- Hindering the formation of a thick resistive surface film
- Ti and Al Complexes are actively incorporated into the formed CEI layer
- All additives can help to decrease the interfacial resistance

SERVICE

A German patent application is pending. International applications are possible. On behalf of the Wilhelms University Muenster, PROvendis offers access to rights for commercial use as well as the opportunity for further co-development.