

MOSi Anti-Fading Electrolyte Additives

For high voltage application in lithium ion batteries

Invention

Scientists of the MEET at Wilhelms University of Muenster developed a set of alkylsilyl complexes (**MOSi**) as elecrolyte additive, which enhance the performance of lithium ion batteries.



Previous studies have shown that electrolyte additives based on metals and semimetals (LiBOB, Mg(TFSI)₂, AI(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 properties and/or scavenging towards acidic impurities. This technology combinds these active functionalities (metal core and trialkylsiloxy based ligands) into

one using AI, 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 LiNi_{1/3}Co_{1/3}Mn_{1/3}O₂(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 AI, 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.

Commercial Opportunities

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.

Current Status

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.

Relevant Publications

Coming soon.

An invention of the University Muenster.

Contact: Ref. No.: 4520 Dr. Thorsten Schaefer

PROvendis GmbH

Schlossstrasse 11-15 D-45468 Muelheim an der Ruhr, Germany Phone: +49 (0)208 94 105 27 Fax: +49 (0)208 94 105 50 Email: ts@provendis.info Web: www.provendis.info

Competitive Advantages

- 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 LiNi_{1/3}Co_{1/3}Mn_{1/3}O₂
- 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