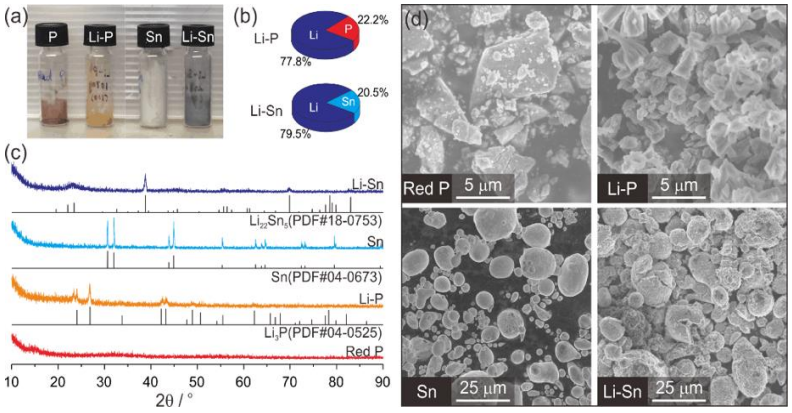
Pre-lithiation electrolyte additive for Li-Ion Batteries

OTT ID #1582

TECHNOLOGY

The inventors have created a family of chemical additives to mitigate lithium ion losses during solid electrolyte interphase (SEI) formation in Lithium Ion Batteries (LIB) to meet the ever-growing performance requirements. These chemical additives and methods make extra lithium ions available during charge discharge cycles thereby slowing capacity fade. This new additive addition process easily integrates with existing manufacturing process and can also be used with sodium ion batteries.



An important goal of the battery industry is extending battery lifetime. Lithium-ion batteries (LIBs) with high energy densities and good cycling performance are highly desired for the widespread usage of portable electronic devices and the emerging market of electric vehicles. The conventional LIBs are primarily based on graphite negative electrodes (NE) and lithium metal oxide (LMO) positive electrodes (PE) and their energy densities are typically 150 ~ 200 Wh kg-1, which struggle to fulfil the increasing demand. Very positive test results have been obtained for these new additives and method that provide numerous benefits over current batteries on the market.

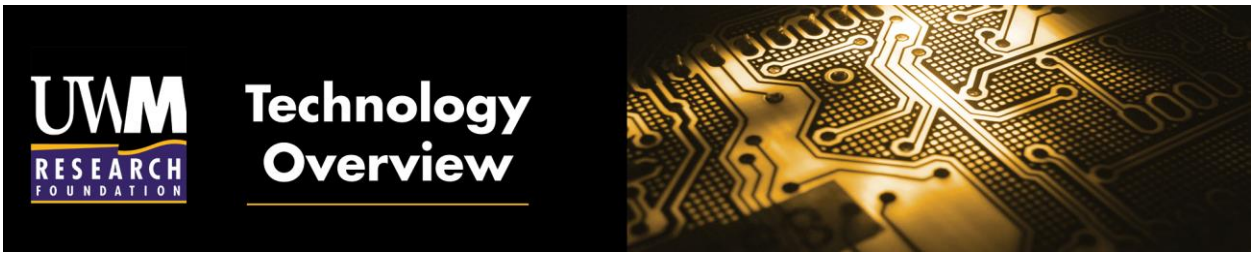
FEATURES and BENEFITS

- **Reduces Initial Capacity Loss –** Helps compensate for the initial capacity loss during SEI formation.
- **Easier to Manufacture–** Can be prepared in ambient conditions without a dry room
- **Retrofit –** The technology can be easily fit into existing manufacturing process without substantial capital expenditure
- **Strong Performance** – Increase in capacity per unit volume to enable longer driving distance and usage time
- **Reduces SEI** – Pre-lithiation compensates for active loss through SEI
- **Improves** -The available energy densities of Li-Ion Batteries

INTELLECTUAL PROPERTY

Provisional Patent Application filed September 2018.

This technology is part of an active and ongoing research program and is seeking partners for development of the final product. It is available for developmental research support and/or licensing under either exclusive or non-exclusive terms.



MARKETS

Lithium-ion global market is projected to be 14.8 B by 2021 and to grow at a CAGR of more than 8% during the forecast period of 2017-2021, according to the latest report in Business Wire.

According to Frost & Sullivan in 2016, the lithium industry grew to $22.5 billion from $11.7 billion in 2012, largely driven by consumer electronic goods and automotive sectors. Meanwhile, the electric vehicles market will hit $750 billion by 2027. The automotive sector's share in the Li-ion battery market last year was at 25 percent compared to 14% in 2012.

Additionally, the global market for sodium-ion batteries will grow from $420 million in 2017 to $1.2 billion by 2022 with a CAGR of 23.9% for the period of 2017-2022, according to the BCC research report 2018.

MARKET POTENTIAL

The proposed technology can be used in Electric Vehicles, Smart electronics, Low cost batteries for consumer electronics, sensors and other applications.

INVENTOR(S)

Dr. Deyang Qu is a Professor/Chair in the Department of Mechanical Engineering at University of Wisconsin, Milwaukee. He is also an Endowed Chair for Johnson Controls. His lab focuses on bridging academic research with industrial product innovations to develop renewable energy. The research areas include metal air, supercapacitors, fuel Cells, lead acid, hydrogen storage materials, and alkaline batteries. His research has been supported by the Office of Vehicle Technology, Department of Energy; Office of Naval Research; NASA (ElectroChem Inc.); the Army (Aspen Product Group); and DARPA (Defense Advanced Research Projects Agency, Maxwell) and Johnson Controls Inc.

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