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Polyanionic Polymers with High Alkali-Ion Conductivity and Wide Electrochemical Windows

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Intellectual Property Status

Patent Pending

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Background

As mobile electronics continue to evolve, the need for high-output, long-lasting rechargeable batteries has grown tremendously. In the search for suitable materials from which to construct high energy density solid state batteries, one of the principal obstacles has been the provision of a suitable electrolyte that exhibits the right combination of conductivity and ion mobility, consistency, wide electrochemical window, and good adherence to electrode surfaces. Very few electrolytes have been developed thus far that exhibit the above combination of performance parameters. Despite significant research in the area, there remains a need for improved electrolytes that can be easily incorporated into voltaic cells without significant extra cost.

Invention Description

Researchers at Arizona State University have developed new chain polymers based on 'Li-BoB', an innovative lithium salt where the lithium ion is unusually weakly coordinating. These polymers have a wide electrochemical window and a very high conductivity. When used to help solidify melts of alkali cation salt mixtures, the resulting product is stable at ambient temperature. Consequently, these materials are extraordinarily suitable as electrolytes for rechargeable lithium batteries.

Potential Applications

- **Rechargeable Batteries**
- **Fuel Cells**
- **Photovoltaic Cells**
- **Photochromic Displays**
- **Other Electrochemical Applications**

Benefits and Advantages

- **Very High Conductivity** – Conductivities of 10-4.7 S/cm have been achieved – the highest ever reported for a single ion conductor without aluminum
- **Longer Cycle Life** – The polymers remain highly effective even after hundreds of charge / discharge cycles
- **High Stability / Low Volatility** – Electrolytes constructed with these polymers exhibit high thermal stability and low ambient temperature volatility
- **Wide Electrochemical Window** - The solvents have a wide electrochemical window of ~4.5 volts