AzTE Arizona Technology Enterprises

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Environmentally Benign Electrolytes With Wide Electrochemical Windows

AzTE Case #96-024

Background

As mobile electronics continue to evolve, the need for safe, 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 electrolyte solvents that can be easily incorporated into voltaic cells without significant extra cost.

Invention Description

One particular group of organic solvents, sulfones, offers promising solutions due to their chemical and thermal stability. Researchers at Arizona State University have developed new non-aqueous solvents comprised of a non-symmetrical, non cyclic sulfone. These solvents are environmentally friendly and have wide electrochemical windows. Safe, high-output electrochemical devices can be facilitated through use of this solvent.

Development

This technology is part of a suite of electrolyte and battery technologies developed at Arizona State University. Significant testing has been completed, and the results have been published. At this time, AzTE is seeking potential partners and licensees for this issued patent and related technologies.

Potential Applications

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

Benefits and Advantages

- **Higher Conductivity** – Conductivities of 10^-2.28 S/cm have been achieved.
- **Higher Solubility** – These solvents can dissolve large mole fractions of most electrolyte solutions including alkali salts. Stable concentrations above 2.5 molar have been achieved.
- **Longer Cycle Life** – The solvents remain highly effective even after hundreds of charge / discharge cycles.
- **Lithium Compatible** – These solvents work well with alkali metal anodes in general, and with lithium and lithium-ion anodes in particular. Additionally, they facilitate the reversible intercalation of lithium into graphite.
- **Lower Volatility** - The solvents exhibit high thermal stability and low ambient temperature volatility.
- **Wider Electrochemical Window** - The solvents have a wide electrochemical window of ~6.0 volts.
- **Environmentally Friendly** - The solvents have minimal environmental impact.

Inventors

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Intellectual Property Status

U.S. Patent 6,245,465

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