



Wide Electrochemical Window Solvents

AzTE Case #717

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Background

Typical electrolyte solvents for use in liquid or polymer electrolyte solutions include alkyl ethers and alkene carbonates. These solvents are used to dissolve electrolyte solutes and/or rubberizing polymer additives to form electrolyte solutions which may be used in electrochemical devices. However, these materials have significant disadvantages. Ethers are volatile and have low dielectric constants, while carbonates are unstable around alkali metals and have high melting points.

Invention Description

Researchers at Arizona State University have developed a new type of molecular solvent having an acidic boron atom as a key constituent. This solvent has such a wide electrochemical window and such powerful solvating properties that it is an excellent target solvent for alkali salts in rechargeable alkali metal anodes, high voltage cathodes, and voltaic cells. High-output electrochemical devices can be facilitated through use of this solvent.

Development

This technology 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

- **High Stability** – This solvent has superior electrochemical stability against anionic decomposition compared to conventional electrochemical solvents. Additionally, it has superior resistance to degradation in the presence of alkali metals.
- **High Solubility** – This solvent can dissolve large mole fractions of most electrolyte solutions including alkali salts.
- **Wide Temperature Range** – This solvent is a glass-forming liquid at room temperature and down to ~-70 degrees C, allowing effective use at low temperatures. Additionally, it exhibits a high boiling point and correspondingly lower ambient temperature volatility.
- **Wide Electrochemical Window** – The solvent has a wide electrochemical window in excess of 4 volts.