Technology Readiness Level: 5
Component and/or Breadboard Validation in Relevant Environment

Eltron Research & Development

Tech Brief

New Electrolytes with Wide Electrochemical Windows

For Li-Ion Batteries

Eltron has developed a new class of materials for use as liquid electrolytes in existing lithium-ion batteries.

Problem

Lithium-ion batteries are an attractive means of supplying a lightweight, mobile source of electricity suitable for both hybrid vehicles (HEVs) and plug-in hybrid vehicles (PHEVs). However, the electrolytes used in these batteries decompose at voltages above 4.2V.

Most efforts at developing electrolytes for lithium-ion batteries are focused on synthesizing solid, polymer electrolytes. These polymers are non-volatile and less flammable than the liquid organic electrolytes they are meant to replace. However, the polymeric electrolyte materials made to date do not transport lithium ions effectively enough to warrant their adoption in batteries large enough to be used in an electric automobile. Organic liquid solvents provide good lithium-ion conductivity but they are chemically unstable, which can potentially lead to "thermal runaway" of a battery under the right conditions.

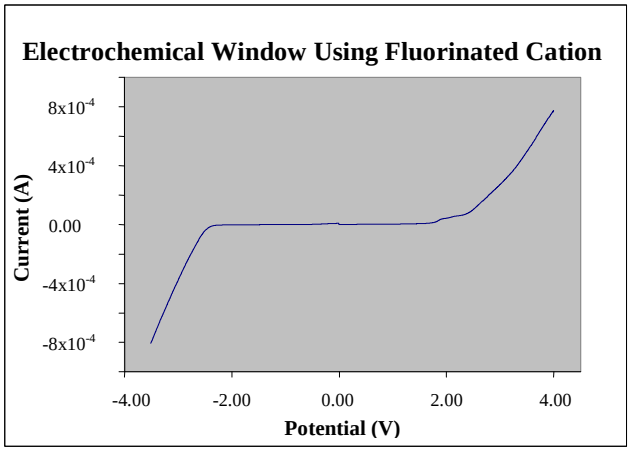

Figure 1. Graph showing where conductivity occurs during cathodic and anodic electrochemical decomposition of a new liquid electrolyte.

Solution

Eltron's approach involves a new class of materials for use as liquid electrolytes in existing lithium-ion batteries. The electrolytes are exceptionally non-reactive, non-flammable and non-volatile, avoiding the hazards associated with organic liquid electrolytes that can help lead to thermal runaway. They also exhibit good lithium-ion conductivity, since these new electrolytes are thoroughly ionic and very polar in character. Figure 1 shows the electrochemical window of one of the new electrolytes. As can be seen in the figure, the electrolyte has a wide electrochemical window, showing stability of 5V, higher than most liquid organic electrolytes.

Applications and Other Benefits

Lithium-ion batteries are being investigated for use in many different applications. Improving their safety and increasing their energy density and specific energy relative to the batteries now being used will make them more effective as the primary or secondary source of power in hybrid automobiles. Other uses include small, portable devices such as cell phones and laptop computers. Their reusability and safety are important issues. These new electrolytes should have very large liquidus ranges, negligible volatility and be completely non-flammable. It is expected that a superior electrolyte for lithium-ion batteries, that will have many commercial applications, will result from this research.

Contact Us

To discuss the possibility of entering into a business relationship with Eltron, contact the Business Development Group at business@eltronresearch.com.

Eltron Research & Development

Eltron Research & Development Inc.
Eltron Research & Development Inc. commercializes novel technologies involving advanced materials, energy, water and environmental systems.

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