The fluoroesters investigated in this study include trifluoroethyl butyrate (TFEB), ethyl trifluoroacetate (ETFA), trifluoroethyl acetate (TFEA), and methyl pentafluoropropionate (MPFP). Solvent mixtures were prepared by mixing these fluoroesters with two other esters: ethylene carbonate (EC) and ethyl methyl carbonate (EMC). The specific solvent mixtures were the following:

1EC + 3EMC + 1TFEB
1EC + 2EMC + 2TFEB
1EC + 1EMC + 3TFEB
1EC + 3EMC + 1ETFA
1EC + 2EMC + 2TFEA
1EC + 3EMC + 1TFEA
1EC + 3EMC + 1MPFP

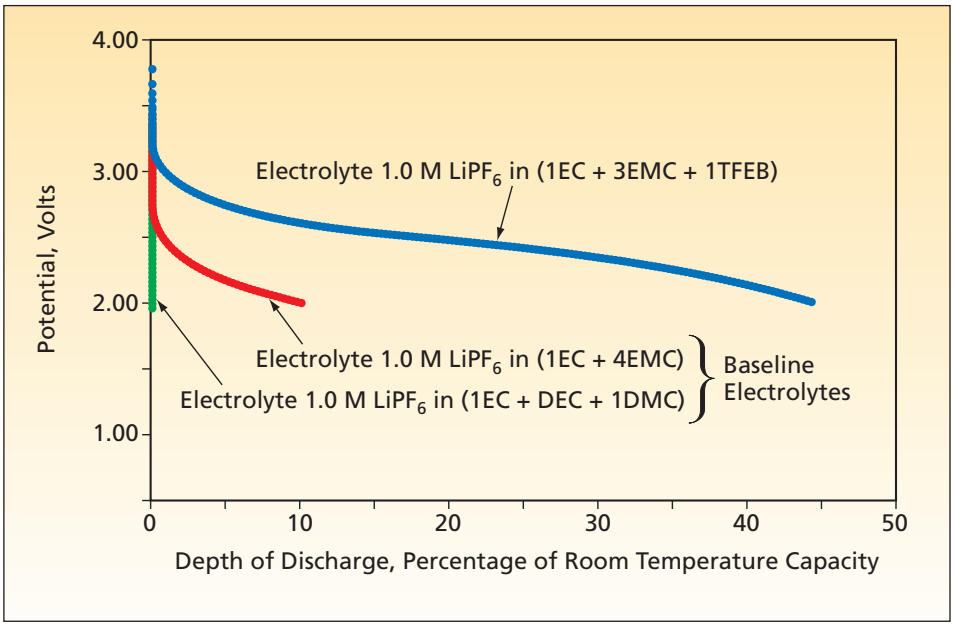
where the numbers indicate the relative volume proportions of the constituents.

Electrolytes were prepared by dissolving $LiPF_6$ at a concentration of 1.0 M in these solvents. In addition, baseline (non-fluoroester-containing) electrolytes were prepared by dissolving $LiPF_6$ at a concentration of 1.0 M in the following solvent mixtures:

1EC + 1DEC + 1DMC
1EC + 4EMC

where "DEC" signifies diethyl carbonate and "DMC" signifies dimethyl carbonate.

Rechargeable carbonanode/$LiNi_{0.8}Co_{0.2}O_2$-cathode cells containing these electrolytes were assembled and subjected to charge-discharge cycling tests at various temperatures from room temperature (23 °C) down to –60 °C. The cells were also evaluated with respect to high-temperature resilience by measuring the fractions of initial reversible capacity retained after storage for 10 days at a temperature of 55 °C. In these tests, the cell containing the electrolyte 1.0 M $LiPF_6$ in (1EC + 3EMC + 1TFEB) exhibited the greatest overall improvements in both low-temperature performance (see figure) and high-temperature resilience over the cells containing the baseline electrolytes.



Potentials of Cells containing various electrolytes were measured at a temperature of –60 °C during discharge at a current of 10 mA to a final potential of 2.0 V.

This work was done by Marshall Smart, and Ratnakumar Bugga of Caltech and G. K. Surya Prakash, Kiah Smith, and Pooja Bhalla of the University of Southern California for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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Refer to NPO-44626, volume and number of this NASA Tech Briefs *issue, and the page number.*

Using Volcanic Ash To Remove Dissolved Uranium and Lead

Lyndon B. Johnson Space Center, Houston, Texas

Experiments have shown that significant fractions of uranium, lead, and possibly other toxic and/or radioactive substances can be removed from an aqueous solution by simply exposing the solution, at ambient temperature, to a treatment medium that includes weathered volcanic ash from Pu'u Nene, which is a cinder cone on the Island of Hawaii. Heretofore, this specific volcanic ash has been used for an entirely different purpose: simulating the spectral properties of Martian soil.

The treatment medium can consist of the volcanic ash alone or in combination with chitosan, which is a natural polymer that can be produced from seafood waste or easily extracted from fungi, some bacteria, and some algae. The medium is harmless to plants and animals and, because of the abundance and natural origin of its ingredient(s), is inexpensive. The medium can be used in a variety of ways and settings: it can be incorporated into water-filtration systems; placed in contact or mixed with water-containing solids (e.g., soils and sludges); immersed in bodies of water (e.g., reservoirs, lakes, rivers, or wells); or placed in and around nuclear power plants, mines, and farm fields.

This work was done by David S. McKay of Johnson Space Center and Raul G. Cuero of Prairie View A&M University. For further information, contact the JSC Innovation Partnerships Office at (281) 483-3809.

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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