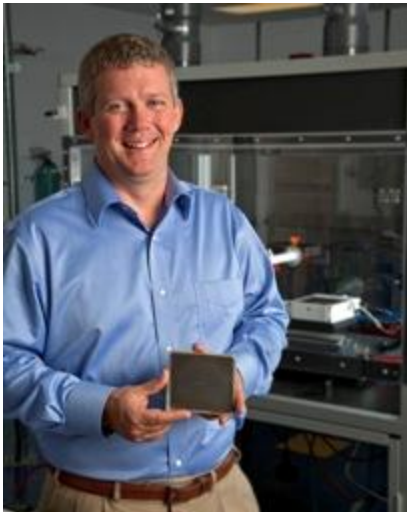


Advanced battery tech will drive auto industry

August 26th, 2010

By Scott Faris



Scott Faris

In July, when members of the Obama administration fanned out across the country to promote initiatives to support development of a U.S. electric-vehicle industry, the president himself announced a national goal of capturing 40 percent of the world's market for advanced batteries for automotive use by 2015.

Right now, the United States makes less than two percent of these batteries, according to the U.S. Department of Energy (DOE).

This is part two of a two-part guest post on advanced battery technology. For part one, see: [Development of new battery tech vital](#).

Batteries based on traditional liquid or polymer electrolyte lithium-ion technology do not scale, or provide the performance or range necessary to make electric vehicles practical and affordable. And the presence of liquid electrolytes makes them unstable and unsafe, requiring costly and sophisticated battery management solutions.

New tech needed

New, transformational energy-storage technology is required to make electric vehicles mass marketable. To that end, the DOE's Advanced Research Project Agency-Energy Initiative (ARPA-E) announced \$106 million in energy research project grants earlier this year.

Included in the DOE funding was nearly \$35 million for the Batteries for Electrical Energy Storage in Transportation (BEEST) program that "seeks to develop a new generation of ultra-high energy density, low-cost battery technologies for long range plug-in hybrid and all-electric vehicles."

A look at two approaches

Systematic innovation that addresses materials, device and manufacturing challenges is what will drive game-changing, advanced battery technologies of the future, which ARPA-E Director Dr. Arun Majumdar told Federal News Radio last April "will make today's lithium-ion batteries obsolete."

Let's look at two of the 10 BEEST-supported approaches: lithium metal-air, which has numerous supporters in the energy storage community, and my own company's solid-state lithium, also regarded as very promising and, we believe, an even more practical approach.

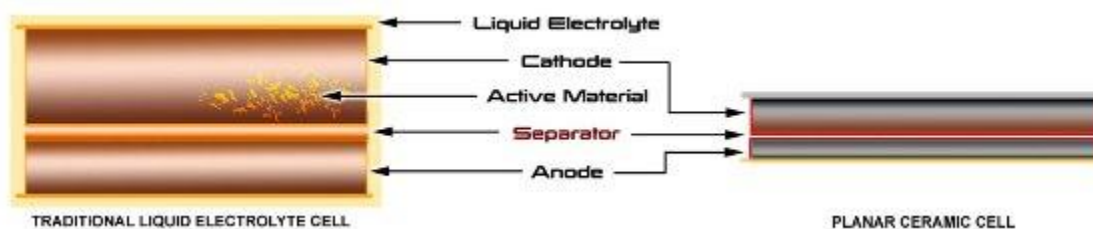
The PolyPlus Battery Company

This Berkeley, Calif., technology company, which has been developing single-use, lithium metal-air batteries for the U.S. government, now has begun to adapt its technology platform to create rechargeable batteries suitable for efficiently powering electric vehicles. It currently is collaborating with Corning to develop ultra-high specific energy lithium metal-air batteries based on protected lithium metal electrodes (PLEs) for transportation applications.

To make PLEs that enable ultra-high energy density batteries with lithium metal semi-fuel cells, PolyPlus says that it employs a solid electrolyte membrane that is impervious to liquids and gases, along with a unique seal, to encapsulate the lithium metal core. As a result, the electrochemically active lithium core remains isolated from the external electrolyte, enabling the formation of lithium metal-air batteries with energy density comparable to gasoline.

PolyPlus says it expects this technology platform to also lead to high-energy, nontoxic and environmentally friendly lithium metal-air batteries that are lightweight and commercially scalable.

Planar Energy



Recognizing the cost, performance and safety limitation of traditional lithium-ion batteries, my company has developed both unique methodology and technology for achieving solid-state storage cells in which the plastics, binders, powders and liquids of lithium-ion batteries are replaced with durable, nanostructured films.

Our technology couples innovative next-generation electrolyte materials with a proprietary low-cost, chemical deposition platform and manufacturing process to deliver large-format, solid-state, ceramic-like batteries at half the cost and triple the performance of existing lithium-ion batteries.

The only solid-state lithium battery company funded by ARPA-E out of thousands of applicants, Planar Energy employs a non-vacuum, ambient roll-to-roll deposition process performed at room temperatures that will sharply reduce manufacturing costs.

Called Streaming Process for Electroless Electrochemical Deposition—or SPEED—it is dramatically more flexible and scalable than existing methods, allowing Planar Energy to make self-assembled, nano-structured electrolyte and electrode materials with superior chemistries and to overcome production barriers to low-cost solid-state batteries.

Planar Energy expects that this deposition process also will reduce capital costs by half compared with solid-state battery manufacturing using high-vacuum machinery, further reducing the cost of its large-format and high-power batteries.

These and other advanced battery technologies that ARPA-E is supporting are not targeting incrementally improved performance and safety. They actually leapfrog what current lithium-ion batteries deliver and, in my estimation, represent the best opportunity to effect the transformational change in energy storage needed for mass market electric vehicles to be profitable for the automobile industry and affordable for consumers.

Scott Faris is founder and CEO of Orlando-based Planar Energy, a spin-out of the DOE's National Renewable Energy Laboratory in Golden, Colo., and recipient of a \$4-million ARPA-E grant to accelerate the development and commercialization of its solid-state lithium battery technology.

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