

ELECTRIFYING THE AUTOMOTIVE MARKET

Argonne innovation built into Chevy Volt



The Chevy Volt at a charging station. Its battery is based on a cathode technology developed at Argonne National Laboratory, which makes the battery safer, longer-lived, and more powerful.

Photo Courtesy of General Motors and U.S. Department of Energy.

CHALLENGE

Develop battery technology that extends the range for electric vehicles while increasing safety and decreasing price.

SOLUTION

Using deep knowledge of materials and electrochemistry, researchers invented lithium- and manganese-rich materials that are able to store more electricity than those found in pre-existing designs. The resulting technology offers the longest-lasting energy available in the smallest, lightest package: a 50 to 100 percent increase in energy storage capacity over conventional cathode materials.

Using the intense X-rays of Argonne's Advanced Photon Source (APS), researchers examined the molecular structure of the innovative battery

material at the atomic level. Watching chemical reactions as they occurred in the lithium-ion battery, scientists obtained the information they needed to understand behavior of the novel cathode materials and then optimize it.

One of the many companies to which the new cathode technology has been licensed is General Motors, enabling the company to introduce the Chevy Volt, the first mass-produced plug-in hybrid electric vehicle.

BENEFITS

- The Chevy Volt has an EPA-estimated range of more than 350 miles on a full charge and a full tank of gas.
- More stable cathode design makes the battery safer and less likely to overheat.

- Upper charging voltage limit increased to 4.6 volts, resulting in a significant jump in the battery's energy capacity.
- Unique lithium- and manganese-rich mixed-metal oxide combination extends the battery's range and increases its calendar life.
- Using inexpensive manganese, battery costs less to manufacture.

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