

Argonne battery technology helps power Chevy Volt

Intense, in-situ X-rays from the Advanced Photon Source at Argonne were used to help Argonne National Laboratory design the technology used in the battery cell that powers General Motors Company's Chevrolet Volt. This plug-in hybrid electric vehicle has an EPA estimated range of 35 miles on a full charge.

X-rays were crucial for designing the Volt's improved battery cathode, the positively charged material, by enabling scientists for the first time to see at the atomic level the molecular structure of battery material.

At the APS, scientists were able to watch chemical reactions while they were occurring in the lithium battery, giving them the information they needed to start modifying and optimizing the cathode materials. Using new synthesis methods, they created lithium- and manganese-rich materials that proved remarkably more stable than those found in existing designs.

Impact

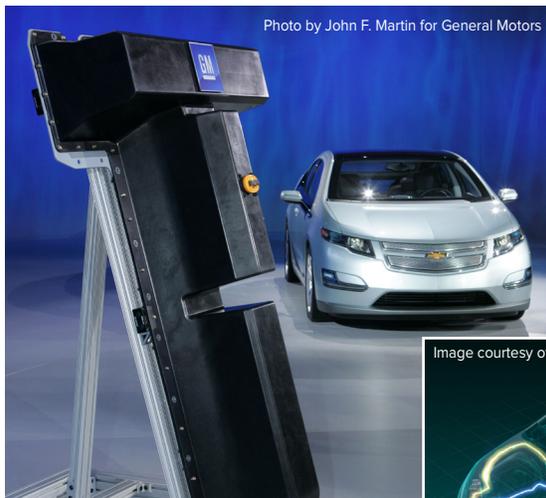
Argonne's breakthrough cathode material has helped enable the introduction of the Chevy Volt, the first mass-produced plug-in electric vehicle.

The Argonne-developed technology offers the longest-lasting energy available in the smallest, lightest package: a 50-100 percent increase in energy storage capacity over conventional cathode materials. Further, its unique lithium- and manganese-rich mixed-metal oxide combination extends the operating time between charges, increases the calendar life and improves the inherent safety of lithium-ion cells.

Because the cathodes design used in the Volt is more stable than those traditionally used in batteries, the new batteries are safer and less likely to overheat. Manganese is cheap, so the battery costs less to manufacture. The upper charging voltage limit also increase to 4.6 volts—higher than the usual operating voltage—and this created a tremendous jump in the battery's energy capacity.

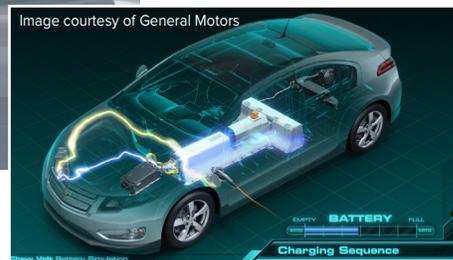
Partners

Argonne's innovative cathode technology has been licensed to five companies: General Motors Co.; LG Chem, Ltd.; BASF; Envia Systems; and Toda Kyogo.



A T-shaped Chevrolet Volt battery replica (left) is positioned near a 2011 Chevrolet Volt electric vehicle. The car's lithium-ion battery is based on technology developed at Argonne National Laboratory.

The 2011 Chevrolet Volt's 16 kWh battery can be recharged using a 120V or 240V outlet. The car's lithium-ion battery is based on technology developed at Argonne National Laboratory.



Funding

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More Info

<http://www.anl.gov/articles/argonne-battery-technology-helps-power-chevy-volt>

http://www.transportation.anl.gov/D3/2012_chevy_volt_phev.html

<http://www.transportation.anl.gov/publications/transforum/v11/v11n1/volt.html>

Timeline

In the late 1990s the U.S. Department of Energy's Office of Basic Energy Sciences funded an intensive study of lithium-ion batteries. Argonne developed and patented cathode material technology in lithium-ion battery cells. LG Chem licensed the technology from Argonne in 2011 and used the materials to create the battery supplied for the Chevy Volt. GM has also licensed the technology for its own tests.



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