

Graphene Material to Reduce Battery Charge Time

Office of Basic Energy Sciences and Pacific Northwest National Laboratory in partnership with Vorbeck Materials and Princeton University

An award-winning scientific advancement could improve the performance of batteries for vehicles and consumer electronics.

Innovation

Researchers at the Pacific Northwest National laboratory (PNNL), Princeton University, and Vorbeck Materials created a new, graphene-infused material that may lead to a higher-performing battery for vehicles and consumer electronics.

The ultimate goal is to create a battery that enables electronic devices and power tools to recharge in minutes rather than hours, or function as part of a hybrid battery system to enable fast longer range and fast charge of electric vehicles.

Outcomes

Technology Advancement

With new insights about material interactions, PNNL and Princeton University showed that small quantities of high-quality graphene could dramatically improve the power and cycling stability of lithium-ion batteries, while maintaining high-energy storage.

Researchers created 3D nanostructures for battery electrodes, using lithium metal with thin films made of Vorbeck's patented graphene material, or composite materials containing the graphene materials. The unique properties of graphene, combined with chemical modification of the graphene and assembly into novel structures, improves the conductivity and controls undesirable surface reactions on lithium. The resulting battery material has the potential to store large amounts of energy and recharge quickly.

Impact

Rechargeable lithium-ion batteries are widely used in electronic devices such as laptops and smartphones, in medical devices, and in power tools and electric vehicles. A successful commercial product based on this technology could enable greater use of electric vehicles and charge consumer electronics faster.



A new material that incorporates graphene technology could extend the life of batteries and accelerate charging time.

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"The pioneering work done by Vorbeck, Princeton University, and PNNL is leading to the development of batteries that recharge quickly, reducing the time it takes to charge a smartphone to minutes and an electric vehicle to just a couple of hours."

John Lettow, President
Vorbeck Materials

Timeline

- 2010:** Vorbeck Materials and PNNL begin working on battery electrodes under a CRADA
- 2012:** First patent granted
- 2012-2015:** Vorbeck Materials and PNNL received support from ARPA-E to further develop the electrode's materials
- 2012:** Vorbeck Materials is named one of three nationwide winners of DOE's "America's Next Top Energy Innovator" challenge
- 2013:** Vorbeck licenses PNNL technology
- 2013-Present:** A portfolio of >13 US patents and >8 foreign patents were granted and licensed.

PNNL: pnnl.gov/news/release.aspx?id=968

OSTI: osti.gov/biblio/1211223-manipulating-surface-reactions-lithium-sulphur-batteries-using-hybrid-anode-structures

OSTI: osti.gov/biblio/1052509-functionalized-graphene-sheets-molecular-templates-controlled-nucleation-self-assembly-metal-oxide-graphene-nanocomposites