

Si-Graphene Anodes (ANL-10-018 and ANL-11-034)

Production process for low-cost, long-life, high-energy anodes with five times the specific energy.

The Invention

An advanced gas phase deposition method to make silicon/carbon composite anodes that offer five times the specific energy of those currently used in lithium-ion batteries. The process embeds nanoscale silicon particles into the graphene layers, a key to longer cycle life and improved capacity.

This approach overcomes the traditional problems associated with high energy density anodes, such as massive volume expansion, high first cycle inefficiency and severe capacity fade.

Benefits

- ▶ Anodes made with this process have five times the specific energy of those made with carbon.
- ▶ When these new anodes are combined with high-energy composite cathodes, resulting batteries have more than double the energy density.
- ▶ The new process allows seamless integration with polycrystalline silicon manufacturing.
- ▶ The process allows low-cost silicon/carbon composite production.

Applications and Industries

Electrodes used in batteries for

- ▶ Electric and plug-in hybrid electric vehicles;
- ▶ Portable electronic devices;
- ▶ Medical devices; and
- ▶ Space, aeronautical, and defense-related devices.



Junbing Yang, inventor of the Si-Graphene composite anodes, working on the composite materials synthesis

Developmental Stage

Proof of Concept

Availability

Available for licensing

Patent Information

U.S. Patent Pending 13/100,579; PCT Patent Pending US 12/35033

Inventors

Junbing Yang, Khalil Amine, Ali Abouimrane and Jianguo Ren

Contact

Argonne Technology Development and Commercialization
partners@anl.gov

