Oak Ridge National Laboratory

ENERGY STORAGE LICENSING OPPORTUNITIES

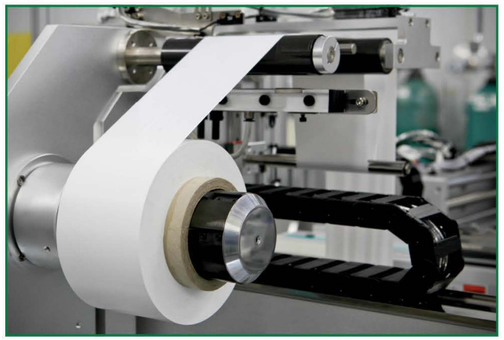
OAK RIDGE National Laboratory

Energy Storage Licensing Opportunities at ORNL

ORNL researchers are working with the US Department of Energy (DOE) and industry to develop new battery technologies that extend battery lifetime, increase energy and power density, reduce battery size and cost, and improve safety. ORNL scientists are concentrating their expertise in electrochemical engineering, novel materials, chemical processing, and systems simulations to identify battery performance limitations and develop revolutionary technologies and manufacturing processes for lithium ion batteries and next-generation energy storage. Using unique instruments and facilities, including the world's fastest supercomputer, the world's brightest neutron source, and the nation's largest open-access battery manufacturing research and development facility, these scientists are studying battery materials from the atomic level up to 7 Ah pouch cells. Many of their innovations are available for licensing, and opportunities exist for collaborative research and development. For a list of ORNL energy storage technologies available for licensing, please visit storagetechnologies.ornl.gov.

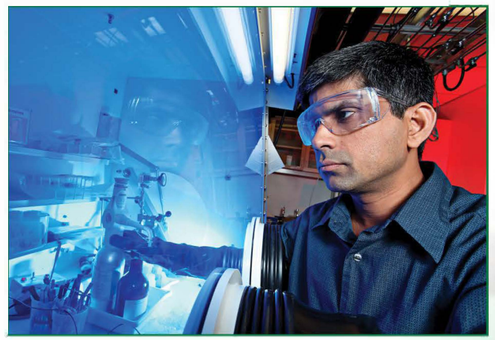
Advanced Lithium Ion Batteries

Commercial applications of lithium ion batteries continue to demand innovations that deliver critical improvements in power, efficiency, cycle life, and safety. ORNL researchers have developed new safety systems that include an electrolyte that solidifies on impact and a "safety foil" system that limits the potential for thermal runaway. They have also developed novel electrolytes, including ionic liquid and solid-state compositions, cobalt-free cathode formulations, and technologies that enable the adoption of silicon anodes. Advanced architectures pioneered at ORNL include a hybrid aluminum-lithium ion battery with enhanced energy density and a new high-density lithium ion battery design.



Process Technologies

Leveraging the DOE Battery Manufacturing Facility at ORNL, ORNL researchers have developed an array of technologies to reduce manufacturing costs while improving battery quality. Recent innovations include a roll-to-roll ultraviolet/electron beam curing process for polymer-ceramic composite electrolytes; a roll-to-roll process for electroplating and flattening metallic lithium; a polymer binder for silicon anodes; a new fast-formation cycle for lithium ion batteries; a process for 3D printing batteries; and methods for monitoring electrolyte wetting, manufacturing self-standing electrodes, and fabricating high volumetric density electrodes from self-aligning short-fiber morphology powders.



Next-generation Energy Storage

ORNL researchers are looking beyond lithium ion chemistries to create new designs and material compositions to meet the nation's future energy storage needs. For low-cost, long-duration, energy storage, ORNL researchers are developing advanced sodium ion batteries, radical anion-mediated redox flow batteries, and hybrid redox flow systems. ORNL researchers have developed a high-voltage electrolyte for ultracapacitors that could potentially double their energy density and are exploring new architectures including metal-air batteries and improved solid-state batteries.

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Licensing Success Story: Solid Power, Inc.

"We're thrilled to add the technology developed at ORNL to Solid Power's portfolio of novel materials and processes built around manufacturing a better battery," said Douglas Campbell, president and CEO of Solid Power, Inc. "The intellectual property ORNL has perfected better positions Solid Power to successfully achieve its mission."

ORNL licensed patents for lithium-sulfur composition for the development of more energy-dense batteries to Solid Power. The battery research at ORNL, supported by DOE's Office of Science and the Vehicle Technologies Office in DOE's Office of Energy Efficiency and Renewable Energy, demonstrated the technology's potential to improve power, operating temperature, and manufacturability and cost.

Solid Power is developing next-generation energy storage devices for the rechargeable battery market. The ORNL technology Solid Power licensed improves rechargeable batteries that can provide two to three times the energy of conventional lithium ion technologies.

For more information, contact:

Michael J. Paulus
Director, Technology Transfer Office

Oak Ridge National Laboratory
PO Box 2008, MS 6196
Oak Ridge, TN 37831-6196
paulusmj@ornl.gov

www.storagetechnologies.ornl.gov

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