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Scientific Breakthrough in Rechargeable Batteries
Researchers from Singapore and Québec Team Up
to Develop Next-Generation Materials to Power Electronic Devices and Electric Vehicles

SINGAPORE, 25 February 2015 – Researchers from Singapore’s Institute of Bioengineering and Nanotechnology (IBN) of A*STAR and Quebec’s IREQ (Hydro-Québec’s research institute) have synthesized silicate-based nanoboxes that could more than double the energy capacity of lithium-ion batteries as compared to conventional phosphate-based cathodes. This breakthrough could hold the key to longer-lasting rechargeable batteries for electric vehicles and mobile devices.

“IBN researchers have successfully achieved simultaneous control of the phase purity and nanostructure of Li$_2$MnSiO$_4$ for the first time,” said Professor Jackie Y. Ying, IBN Executive Director. “This novel synthetic approach would allow us to move closer to attaining the ultrahigh theoretical capacity of silicate-based cathodes for battery applications.”

“We are delighted to collaborate with IBN on this project. IBN’s expertise in synthetic chemistry and nanotechnology allows us to explore new synthetic approaches and nanostructure design to achieve complex materials that pave the way for breakthroughs in battery technology, especially regarding transportation electrification,” said Dr. Karim Zaghib, Director – Energy Storage and Conservation at Hydro-Québec.

Lithium-ion batteries are widely used to power many electronic devices, including smartphones, medical devices and electric vehicles. Their high energy density, excellent durability and lightness make them a popular choice for energy storage. Due to a growing demand for long-lasting, rechargeable lithium-ion batteries for various applications, significant efforts have been devoted to improving the capacity of these batteries. In particular, there is great interest in developing new compounds that may increase energy storage capacity, stability and lifespan compared to conventional lithium phosphate batteries.

The five-year research collaboration between IBN and Hydro-Québec was established in 2011. The researchers plan to further enhance their new cathode materials to create high-capacity lithium-ion batteries for commercialization.

Reference:

About the Institute of Bioengineering and Nanotechnology

Established in 2003, the Institute of Bioengineering and Nanotechnology (IBN) is the world’s first bioengineering and nanotechnology research institute. IBN’s mission is to conduct multidisciplinary research across science, engineering, and medicine for breakthroughs to improve healthcare and quality of life.

IBN’s research activities are focused in the following areas:

- **Nanomedicine**, where functionalized polymers, hydrogels and biologics are developed as therapeutics and carriers for the controlled release and targeted delivery of therapeutics to diseased cells and organs.

- **Cell and Tissue Engineering**, where biomimicking materials, stem cell technology, microfluidic systems and bioimaging tools are combined to develop novel approaches to regenerative medicine and artificial organs.

- **Biodevices and Diagnostics**, which involve nanotechnology and microfabricated platforms for high-throughput biomarker and drug screening, automated biologics synthesis, and rapid disease diagnosis.

- **Green Chemistry and Energy**, which encompass the green synthesis of chemicals and pharmaceuticals, catalytic conversion of biomass, utilization of carbon dioxide, and new nanocomposite materials for energy applications.

For more information about IBN, please visit www.ibn.a-star.edu.sg.

About the Agency for Science, Technology and Research

The Agency for Science, Technology and Research (A*STAR) is Singapore’s lead public sector agency that fosters world-class scientific research and talent to drive economic growth and transform Singapore into a vibrant knowledge-based and innovation-driven economy.

In line with its mission-oriented mandate, A*STAR spearheads research and development in fields that are essential to growing Singapore’s manufacturing sector and catalyzing new
growth industries. A*STAR supports these economic clusters by providing intellectual, human and industrial capital to its partners in industry.

A*STAR oversees 18 biomedical sciences and physical sciences and engineering research entities, located in Biopolis and Fusionopolis, as well as their vicinity. These two R&D hubs house a bustling and diverse community of local and international research scientists and engineers from A*STAR’s research entities as well as a growing number of corporate laboratories.

For more information on A*STAR, please visit www.a-star.edu.sg.

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Hydro-Québec generates, transmits and distributes electricity. It is Canada’s largest electricity producer and is among the world’s largest hydropower producers. Its sole shareholder is the Québec government. It uses almost exclusively renewable generating options, in particular hydropower, and supports the development of other sources of energy, such as wind and biomass, through purchases from independent power producers. Its research institute, IREQ, conducts R&D in energy efficiency, energy storage and other energy-related fields. Hydro-Québec invests $100 million in research every year.

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