

Zentek Provides Update on Battery Technology Development

written by Raj Shah | October 28, 2022

October 28, 2022 ([Source](#)) – Zentek Ltd. (“Zentek” or the “Company”) (NASDAQ:ZTEK)(TSXV:ZEN), an intellectual property development and commercialization company, announces the commencement of a 4-year, \$1.6M research project in collaboration with Professors Mohini Sain and Ning Yan from the University of Toronto (“U of T”) and Ford Powertrain Engineering Research and Development Centre (“PERDC”). Funding for the project includes \$1.2M from the Mitacs Accelerate program. Prof. Sain is the Endowed Ford Motor Canada Chair in Sustainable Materials where he is active in the field of light energy storage including cell chemistry and renewable fuel battery development at PERDC, and Prof. Yan is the Tier 1 Canada Research Chair in Sustainable Bioproducts. Collaborating with the PERDC and testing at this facility is essential to demonstrate battery advances at a scale suitable for the automotive industry.

“The Canadian government and the auto industry have committed to invest over \$10 billion in battery manufacturing in 2022 alone. With the significant push toward electrification in North America, we are excited to be working with the team from U of T, who have worked with a number of international battery manufacturing companies,” said Greg Fenton, CEO of Zentek. “This is an important research project to seek to develop next generation graphene-based battery materials to potentially enhance energy density, increase charging rates and improve battery safety.”

The project seeks to test novel concepts for the purpose of

inventing multifunctional materials to be used in automotive battery components including anode, cathode, electrolyte, and separator. Zentek will be working in tandem with U of T researchers providing and testing advanced graphene materials including Zentek's patent-pending anode material developed by Dr. Michael Pope (see Zentek's press release dated February 18, 2022).

Update from Dr. Michael Pope's Group at the University of Waterloo

Further to Zentek's press releases dated November 22, 2018 and February 18, 2022, Zentek has been collaborating with Dr. Michael Pope at the University of Waterloo for the last three years, developing battery technology to improve anode performance.

One highly studied area for lithium-ion battery (LIB) development is to improve the anode material. Currently electric vehicle anodes are composed of graphite, which has a limited theoretical specific capacity of $\sim 372 \text{ mAhg}^{-1}$. Silicon (Si) has attracted significant attention as a replacement material, mainly due to its high specific capacity of $4,200 \text{ mAhg}^{-1}$, but also due to its low working potential, low price and the availability of silicon. However, the industrialization of silicon anodes is hindered by an important engineering roadblock: silicon has an enormous volumetric fluctuation (greater than 300% in all dimensions) when charging and discharging. This feature is the root cause behind three major issues:

1. Poor cycle lifetime due to self-pulverization of the anode.
2. Irreversible capacity loss and low coulombic efficiency.
3. Destruction and reformation of the solid-electrolyte

interface, which consumes electrolyte and causes thickening and poor ionic mobility.

Using silicon in the anode material, Dr. Pope has addressed these issues, and has created a patent-pending graphene wrapped silicon anode material.

Key characteristics of graphene-wrapped silicon anode, as announced in February 2022 include:

- At practical mass loading of $2.5\text{mg}/\text{cm}^2$, the electrode achieved $2.04\text{mAh}/\text{cm}^2$ and retained 79% of this capacity after 200 cycles against a lithium half-cell.
- When paired with a commercial lithium iron phosphate cathode, the fully assembled battery retained 93.3% of its initial capacity over 100 cycles.
- Works with current lithium-ion batteries as a replacement for graphite¹.

Since April, Dr. Pope's team has optimized the anode material, which now has a specific capacity of over $1,000\text{mAh}/\text{g}$ and retains over 80% of its capacity over 320 charge-discharge cycles. The specific capacity of this material is a significant improvement over common graphite anodes; however, the cycle life still requires improvement compared to typical electric vehicle batteries, which lose about 4% capacity over 1,000 charge-discharge cycles. Zentek and Dr. Pope's team will continue to develop this technology with the goal of improving performance to meet industry requirements. Newly optimized chemistries are reaching specific capacities as high as $1,500\text{mAh}/\text{g}$, an over 400% improvement over graphite anodes. This significant improvement in energy density is complemented by impressive cycle stability. These performance tests were done under accelerated protocols and will need to be confirmed in standard tests.

Zentek filed a patent application under the Patent Cooperation Treaty on May 17th, 2022.

About Zentek Ltd.

Zentek is an IP development and commercialization company focused on the research, development and commercialization of novel products using graphene and nanomaterials for use in the healthcare industry and beyond.

Zentek's proprietary ZenGUARD™ coating is patent-pending and shown to have 99% antimicrobial activity, including against COVID-19, for use in PPE and potentially HVAC systems and other industries. Zentek's ZenGUARD™ production facility is located in Guelph, Ontario.

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To find out more about Zentek Ltd., please visit our website at www.Zentek.com. A copy of this news release and all material documents in respect of the Company may be obtained on ZEN's SEDAR profile at <http://www.sedar.com/>.

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