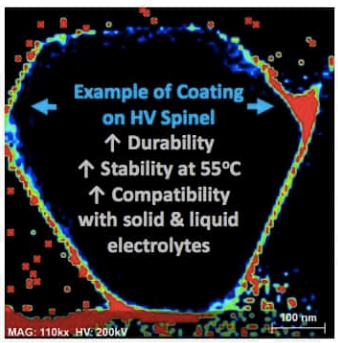
Nano One Develops Novel Coating Technique for a Longer Lasting Battery

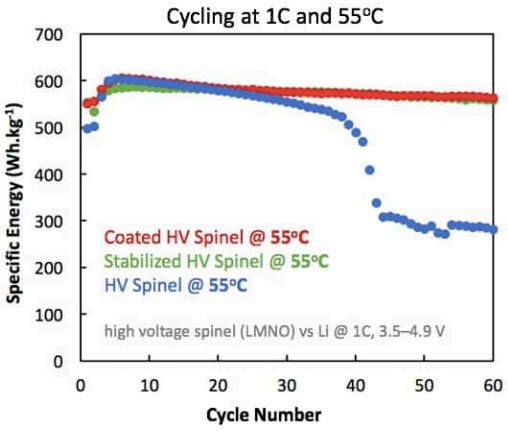
written by Raj Shah | April 19, 2018

April 19, 2018 (Source) – Dr. Stephen Campbell, Principal Scientist at Nano One (TSXV: NNO) (OTC Pink: NNOMF) (FSE: LBMB), announced today that Nano One has developed coating technology that stabilizes cathodes for use in advanced lithium ion batteries and has applied for patent protection related to this coating technique.

"The innovation applies a coating to particles of cathode material without adding steps to our process," explained Dr. Campbell, "and this reduces degradation and resistance between the cathode and the electrolyte in lithium ion batteries. We are encouraged by the preliminary results of our findings as this could help solve long-standing degradation mechanisms, enable energy dense battery designs, and increase the number of times that a battery can be recharged over its lifetime."



Scan of sectioned HVS particle showing coating on spinel structure



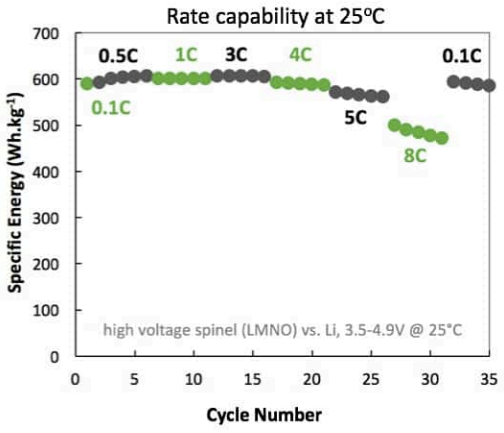


Figure 1: Nano One Coating Process

“The improvements are pronounced under warmer operating conditions, such as those seen in electric vehicles,” added Dr. Campbell. “This is particularly suited to the commercialization of high energy and high voltage cathode materials, where the elimination or reduction of cobalt requires alternatives to enhance stability and durability.”

These advances have now enabled Nano One to increase its collaborative work with European and Asian commercial interests in the automotive supply chain, with the aim of developing materials for next generation solid state batteries. A detailed and technical explanation of the opportunity is provided below.

A stable, ion conducting coating on the surface of Nano One’s High Voltage Spinel (HVS) could solve interfacial problems for both liquid and solid ceramic electrolytes by inhibiting manganese dissolution in liquids and increasing conductivity with solid state electrolytes. Nano One has developed two types of coatings that stabilize the cathode when cycled at 55°C which could improve durability and stability without impacting capacity.

HVS has attracted attention in the lithium battery supply chain for two reasons. Firstly, the material contains no cobalt and based on cobalt supply constraints, HVS could reduce supply risk. The material contains primarily manganese and a small portion of nickel, and thereby measurably lower costs. Secondly, HVS has the highest and one of the most constant discharge voltages, measuring 4.7 volts which offsets its lower capacity. HVS also has high rate capability, which means that it can be charged and discharged rapidly without losing capacity.

On its own, HVS degrades rapidly when cycled at 55°C which is a design criterion for electric vehicles. Also, charging and

discharging at 4.7 volts may cause the degradation of common liquid electrolytes which are considered unstable above 4.2 volts.

One solution to the electrolyte issue is to replace the liquid electrolyte with a solid polymer, glass or ceramic fast ion conductor. The Solid-State Electrolyte (SSE) makes dendritic cell failure and fire unlikely, and so enables the use of a lithium metal anode, replacing the bulky graphite with an ultra-thin anode and increasing the energy density of the cell. This solid-state design opens the opportunity for a safer, denser and high voltage lithium ion cell. Ceramic fast ion conductors such as $Li_{3.25}Ge_{0.25}P_{0.75}S_4$ (ref Kanno and Murayama J. Electrochem. Soc.;148(2001) A742) can have lithium conductivities as high as current liquid electrolyte.

Unfortunately, the physics of the HVS/SSE interface creates a highly resistive layer and high ionic conductivity is not realized when cells are constructed. Nano One has developed a coating that could increase ion conductivity with SSE's and passivate manganese dissolution in liquid electrolytes while reducing electrolyte instability above 4.2 volts. This innovation has led Nano One to apply for patent protection.

CEO Dan Blondal added "We are encouraged by this innovation and we believe this technology could be of similar value to nickel-rich low-cobalt NMC's where instabilities, voltage limitations and degradation are preventing commercial adoption in lithium ion batteries. Work initiated with commercial interests is growing and will focus on the integration of these materials with other advances in high energy and solid-state batteries. We look forward to sharing progress on these initiatives as they develop in the future."

Nano One Materials Corp.

Dan Blondal, CEO

About Nano One:

Nano One Materials Corp (“Nano One” or “the Company”) is developing patented technology for the low-cost production of high performance battery materials used in electric vehicles, energy storage, consumer electronics and next generation batteries. The processing technology addresses fundamental supply chain constraints by enabling wider raw materials specifications for use in lithium ion batteries. The process can be configured for a range of different nanostructured materials and has the flexibility to shift with emerging and future battery market trends and a diverse range of other growth opportunities. The novel three-stage process uses equipment common to industry and Nano One has built a pilot plant to demonstrate high volume production and has preliminary engineering plans in place for full scale production of a range of cathode materials. This pilot plant program is being funded with the assistance and support of the Government of Canada through Sustainable Development Technology Canada (SDTC) and the Automotive Supplier Innovation Program (ASIP) a program of Innovation, Science and Economic Development Canada (ISED). Nano One also receives financial support from the National Research Council of Canada Industrial Research Assistance Program (NRC-IRAP). Nano One’s mission is to establish its patented technology as a leading platform for the global production of a new generation of nanostructured composite materials. For more information, please visit www.nanoone.ca

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