

Nano One Performs Well in Solid State Battery Tests at the University of Michigan

Nano One Materials Corp. (TSXV: NNO) reported this week that its technology performed well in solid-state battery testing with the University of Michigan (UM).

UM's battery laboratories are exploring various aspects of battery components, designs, interfaces, and assembly of solid-state electrochemical batteries.

Nano One focuses on its patented process for the production of cathode materials used in lithium-ion batteries and is collaborating with the UM on the development of innovative solid-state battery technology.

Richard Laine, Ph.D., Professor of Materials Science and Engineering at the UM commented, "Initial results from our evaluations show that Nano One's HVS materials perform well with our innovative agricultural waste derived electrolytes and we look forward to advancing our collaboration to demonstrate a viable solid-state battery configuration."

Cathode Key for Power and Reducing Costs

The cathode determines the battery's capacity and voltage, and can comprise 20% or more of the costs of a lithium-ion battery. Nano One has developed technology for the low-cost production of high-performance lithium-ion battery cathode materials used in electric vehicles, energy storage devices, and consumer electronics.

Nano One has programs underway with multiple academic research groups, automotive equipment manufacturers, and battery manufacturers to test its lithium-nickel-manganese-cobalt-

oxide (NMC) and high voltage spinel (HVS), also known as lithium-nickel-manganese-oxide (LNMO), cathodes in different solid-state battery systems.

LNMO cathodes have garnered industry attention by providing a low-cost, fast charging, and cobalt-free solution, key in cost-effective, large-scale commercial applications.

In December 2020, Nano One announced that it entered into a cathode evaluation agreement with an undisclosed, American-based, car manufacturer. This agreement is in addition to the deals announced with Volkswagen, Pulead, Saint Gobain, and an undisclosed Asian cathode producer.

Nano One's proprietary "One Pot" furnace process creates a coated single crystal powder that protects the cathode from side reactions while allowing the transfer of lithium ions between electrolyte and cathode.

In addition, the "One Pot" process offers the flexibility to use either lithium carbonate or lithium hydroxide as the reaction with the other metal inputs is indifferent to the type of lithium input and produces a finished cathode powder when thermally processed in a furnace.

It is also an environmentally friendly process using limited water and produces no waste stream as it eliminates intermediate steps and by-products in the process.

The Basics of Battery Technology

Reduced to its basics, a lithium-ion battery consists of 4 components: (1) a Cathode, the source of the lithium ions, (2) an Anode, the storage area of released lithium ions, (3) the Electrolyte, the medium which helps the ions flow, and (4) the Separator that prevents contact between the Cathode and the Anode.

The chemical reaction creates a voltage potential between the

cathode and the anode. The voltage is the electrical force from the power source, the higher the voltage, the more power it can send to the load, such as a motor.

A solid-state battery uses solid electrodes and a solid electrolyte, instead of liquid or gel electrolytes, found in conventional lithium-ion or lithium polymer batteries. As a solid-state battery can handle more charging and discharging cycles before degradation, it promises a longer lifetime.

In November 2020, Nano One reported that its HVS cathode when paired with a conventional electrolyte and a graphite anode achieved over 500 fast charge and discharge cycles at 45°C and also reached 1000 fast charge and discharge cycles at 25°C. These durability test results confirmed that its technology is stable at elevated operating temperatures required for automotive, power tools, and energy storage applications.

Cashed Up to Reach Commercialization

Recently, Nano One announced it received \$4.46 million from the exercise of stock options and warrants since its last financial update dated October 1, 2020, and brings the company's cash balance to approximately C\$28 million, including \$14.37 million the company raised in October 2020.

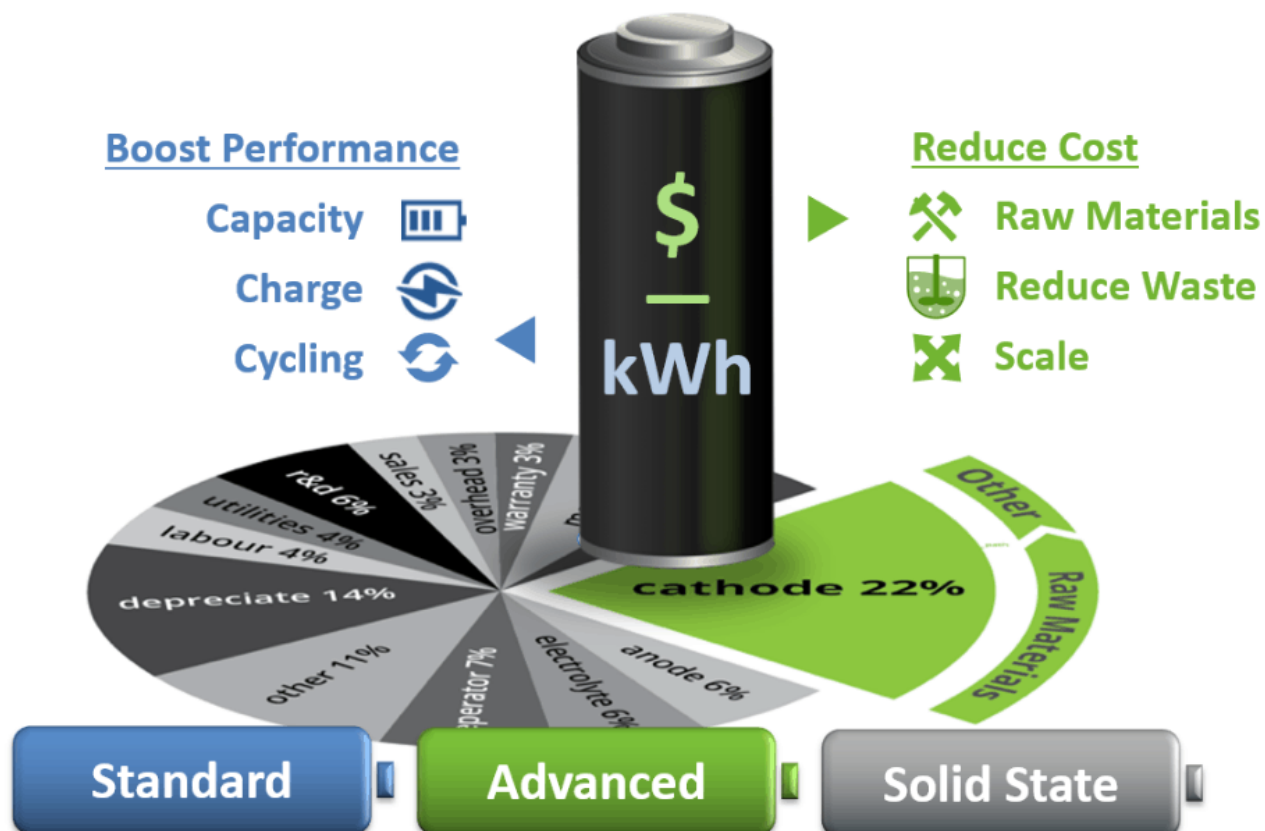
Final Thoughts

Nano One's technology is well-positioned to capitalize on the opportunities in the battery technology industry as economies shift to electrification efforts from solar, wind, and electric vehicles to reduce greenhouse gas emissions from fossil fuels.

This week, the Toronto Stock Exchange (TSX) Venture Exchange's named Nano One to its "2021 Venture 50", an annual ranking of the top-performing companies on the exchange. Companies are selected based on share price appreciation, trading volume, and market capitalization growth. Nano One's stock price is up

almost 300% in the past year.

Even with the recent stock price increase, there is plenty of market opportunity for the company. Nano One estimates the global cathode market could reach US\$27 billion by 2026 and the company is focusing on potential licensing partners for its technology that should mitigate some of the risks.



SOURCE:

The million mile battery is ahead for electric vehicles –

and investors

Nano One positioned for great things as the EV boom approaches

Superior battery technology continues to move towards significant breakthroughs such as the 'million mile battery' and 'low cost/fast charging' lithium ion batteries. These new advances will act as a huge boost for electric vehicle (EV) sales and allow the next generation of EVs to become super competitive with conventional cars. The **million mile battery** suddenly makes EVs the preferred choice for fleet operators (taxis, hire cars, deliveries, trucking etc) and the cheaper/fast charging batteries mean that by 2022 we should start to see EVs reach price parity with conventional cars. This will lead to a tsunami of EV sales.

All of this is only possible because of scientific breakthroughs by leading companies such as Nano One Materials Corp. (TSXV: NNO). Car and battery manufacturers are jumping onboard so that they can remain competitive in a rapidly changing auto world. Volkswagen's partnership with Nano One is just one of many examples.

Understanding the massive changes happening in the auto industry helps explain why Nano One's stock is up 145% over the past year as investors start to see their potential of the predicted US\$23 billion cathode market opportunity. Specifically, Nano One is targeting the licensing opportunity to improve cathodes estimated at \$1 billion in annual revenues by 2025.

Nano One's mission is to establish its patented technology as a leading platform for the global production of **a new generation of battery materials**. Nano One has developed patented technology for the low-cost production of high-

performance lithium ion battery cathode materials.

Nano One is targeting a potential \$1b licensing opportunity in the \$23b cathode market by 2025

✘ Source

Investors might think that it is too late to buy into Nano One looking at recent stock price gains, but actually on the current market cap of C\$239m if Nano One can deliver the potential revenues below as per their targets the stock will have appeared cheap. This is because they are targeting about \$70m a year in revenues by 2025 and profit margins are expected to be extremely high.

Nano One potential revenues by 2025

✘

Source

Nano One's patented cathode used for the 'million mile battery'

Nano One announced in June this year the development of a coated, single crystal cathode material for lithium ion batteries that is providing **up to 4 times improvement in longevity**. The technology is applicable to all of Nano One's cathode materials but is especially relevant to lithium nickel manganese cobalt oxide (NMC811). According to Nano One, "Increased durability is critical in enabling extended range, faster charging and even million mile batteries for electric vehicles."

This breakthrough makes the 'million mile battery' within reach. Such a battery would mean EVs can last at least 4x longer than a conventional car. The implications are enormous. Fleet operators will be lining up to buy EVs with million mile batteries.

Nano One's other key projects (LFP cathodes, and solid state battery cathodes)

Nano One has also made great progress in reducing the cost and improving the performance of Lithium Iron Phosphate (LFP) cathodes. Nano One has developed patented 'one-pot cathode materials and production processes' that reduces both the time and cost of LFP production. Working with partners such as Pulead who specialize in LFP cathode production opens up the door for licensing opportunities.

Nano One is also working on a breakthrough for the 'holy grail' of batteries – a solid state battery. Nano One's patented cathode tests positively in solid state batteries with auto companies. Nano One says that their "cobalt free cathode reduces supply chain risk, increases power and enables fast charging," and their "coated nanocrystal cathodes (single crystal) boost durability, capacity and charge rates."

Nano One is partnered for success

Nano One is very well partnered into the EV/battery supply chain via partnerships with industry giants Volkswagen, Pulead, Saint-Gobain and other undisclosed global automotive interests. Added to this they have had the support of the Canadian government.

Closing remarks

With so many breakthroughs in one year it is little wonder that Nano One's stock price is up 145%. Great management, great technology, and great partners are always a winning formula.

Nano One currently has a market cap of C\$234m and looks poised for great things as the real EV boom is just about to begin.

Further learning

- Dan Blondal on Nano One's breakthrough in lithium-ion

Nano One's Dan Blondal on the evolving cobalt free solid-state battery

"There is lots more to come. Some of the partners we are working with, some of the agreements we are working on will certainly bring value to the table." – states Dan Blondal, CEO of Nano One Materials Corp. (TSXV: NNO) ("Nano One") in an interview with InvestorIntel's Jeff Wareham.

Jeff Wareham: Welcome back to InvestorIntel. I am joined again today by Dan Blondal who is with Nano One Technologies. Dan you guys have had a very, very exciting past month. Announcements in lithium around your cathode stuff. Personally, what I want to hear about is your cobalt-free battery announcement. What is a solid-state battery?

Dan Blondal: A solid state battery gets rid of the liquid electrolyte in the lithium-ion battery, which is the flammable part of the battery actually and replaces it with glass or a ceramic material between the two electrodes. It allows the manufacturer to put a very ultrathin anode on it so it actually halves the size of the battery, makes it safer, costs come down and energy density goes up. It is a very attractive architecture for batteries; very much next generation. We are not going to see them for probably 2 to 5 years in the marketplace, but we are really thrilled to be involved with it.

Jeff Wareham: It sounds like with what is going on the cobalt

market there is going to be a lot of interest in anything where you can eliminate that from the process. What do you think?

Dan Blondal: I absolutely think so. We are working on both cobalt containing materials and cobalt-free materials. Our cobalt-free high voltage spinel is particularly applicable to solid state batteries so it is a natural fit there.

Jeff Wareham: Is this primarily going to be an automotive application, or would there be other places where that battery could be used as well?

Dan Blondal: Anywhere the energy density and that would be portable electronics. Anything where the density and the weight and the thickness of the battery has consumer value so that would be in electric vehicles, consumer electronics, tools, anything like that.

Jeff Wareham: So, a direct competitor of the lithium-ion space?

Dan Blondal: Well, it is still a lithium-ion battery actually. The cathode materials are pretty much the same. You are still inserting lithium-ions back and forth in the battery. It is still considered a lithium-ion battery just that you are replacing that liquid component with a solid component...to access the complete interview, [click here](#)

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