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IN FOCUS: NANO ONE MATERIALS CORP. AND ITS TECHNOLOGY AND APPLICATIONS IN THE ENERGY STORAGE SUPPLY CHAIN

This report provides an overview of Nano One Materials Corporation and its technology and applications in the upstream portion of the energy storage supply chain.

Nano One Materials offers process technology for lithium-Ion battery cathodes. Source: www.nanoone.ca

THE ALPHADIRECT INSIGHT

Nano One Material has developed a new processing technology for the way cathode powders are used for liquid and solid electrolyte-based lithium ion batteries. The technology makes the full range of cathode materials and improves both costs and performance, in our view. We believe Nano One's technology differs from conventional processes available in the market today. Specifically, the company uses an innovative process technology that combines all ingredients in a single water-based reaction before drying and heating the material in a furnace. This simplified chemical process enables Nano One to produce a homogeneous mixture of lithium and other metals at the atomic level which form crystal structures earlier in the process. By using its technology, Nano One manages to simplify many various steps during the process, reduce time in the furnace and eliminate waste streams. According to the company, this process enables the use of lower cost feedstock, drives down processing costs and improves performance. We believe this is an ROI driven technology and provides a unique opportunity for investors to participate in the upstream portion of what we believe is one of the biggest megatrends in the market today – energy storage.

NNO.V Business Snapshot

Founded: 1987
Headquarters: Burnaby, Canada
Ticker: NNO.V (TSX)
Stock Price: USD$1.30*
Market Cap: USD$88.948M*
Website: www.nanoone.ca
**As of April 3, 2019*

nanoOne

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Participants

Dan Blondal
CEO, Director & Founder
Nano One Materials Corporation

Mr. Blondal has 26 years of experience as a professional engineer, managing high growth technology in a career that has spanned materials handling, medical devices, industrial printing, nuclear fusion and materials science. He is credited with eight patents issued in Canada, the US and foreign jurisdictions. He has served in various roles at Fluor, Andronic Devices, Creo, Kodak, and alternative energy start-up General Fusion, including Engineer, Project Engineer, Product Manager, Technology Manager and Director of Environmental and Regulatory Affairs. Mr. Blondal brings significant experience in systems engineering, physics and business. As Product and Technology Manager at Creo and Kodak, he led strategically vital initiatives valued at $20M annually to leverage software, laser and chemical systems for high-quality printing.

Mr. Shawn Severson
Founding Partner
***alpha*DIRECT Advisors**

Mr. Severson is the Founding Partner of *alpha*DIRECT Advisors (ADA), a division of EnergyTech Investor, LLC (ETI). He has over 20 years of experience as a senior research analyst covering the technology and cleantech industries. Prior to founding *alpha*DIRECT Advisors, he led the Energy, Environmental and Industrial Technologies practice at the Blueshirt Group. Mr. Severson was frequently ranked as a top research analyst including one of the Wall Street Journal's "Best on the Street" stock pickers and multiple awards as Starmine's top three stock pickers.

ABOUT NANO ONE MATERIALS CORP.

Nano One Materials Corp ("Nano One" or "the Company") has developed patented technology for the low-cost production of high-performance lithium ion battery cathode materials used in electric vehicles, energy storage and consumer electronics. 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 the full range of cathode materials and has the flexibility to shift with emerging and future battery market trends.

Nano One has built a pilot plant to demonstrate high volume production and to optimize its technology across a range of materials. The pilot plant 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 battery materials. www.nanoone.ca

Shawn Severson: First I'd like to thank you, Dan, for taking the time to speak with us. Today we're covering Nano One Materials and your technology in the upstream part of the energy storage supply chain. However, before we dig into the topic, can you start by giving us a brief introduction of yourself and your team?

Dan Blondal: It's a pleasure to be here. I am CEO and a founder of Nano One Materials. I'm an engineer and have been involved with materials, mining and a range of technologies that span medical devices, digital printing, nuclear fusion and batteries. During my career, I've worked in startups and very large companies. At Nano One, we have a twenty-person technical team led by Dr. Stephen Campbell who is our Chief Technology Officer and he heralds 25 years of working in the battery and fuel cell space with Ballard Power Systems and its Ford–Daimler spinoff, AFCC. Stephen is a world class electrochemist with considerable experience in the industrialization of electric vehicles and energy storage systems.

On the market side, President and co-founder, John Lando, brings 26 years of capital markets experience and our Chairman, Paul Matysek, who has generated over two billion dollars of enterprise value through buying and selling companies, such as Lithium X and Lithium One.

Shawn Severson: Thank you very much, Dan. Before you get into the details of Nano One's specific technology, can you provide a basic overview of battery technology and the role the cathode plays in a conventional and a solid-state lithium ion battery?

Dan Blondal: Without diving too heavily into details, it is important to know that a lithium ion battery has a positive and negative electrode. The cathode is a ceramic powder coated onto aluminum foil and is made from lithium, cobalt, nickel and other metals. For instance, lithium cobalt batteries (LCO) address the need for thin, compact smart phones. Lithium, nickel, manganese and cobalt (NMC) are used in long range electric vehicles and lithium, iron and phosphate (LFP) are used to address safety and cost in electric buses and shorter range EVs.

The other electrode is the anode and is typically made from graphite coated onto a piece of copper foil. The anode and cathode foils are laminated together with a separator, folded into a flat cell or rolled into a cylindrical cell before being soaked in liquid electrolyte and sealed. Charging and discharging the battery moves the lithium between electrodes.

A solid-state battery replaces the liquid electrolyte with a solid electrolyte made of glass, ceramic or polymer-based material. There's still a need for cathode materials, but solid electrolytes do have the potential to eliminate graphite, separators and flammable liquids, while enabling an ultrathin lithium anode, for safer and thinner batteries. It is really the Holy Grail of batteries. It is still a lithium ion battery with pretty much the same range of cathode materials, albeit tweaked to interface with specific solid electrolytes.

Nano One has developed technology to improve the way all of these cathode powders are made, targeting both cost and performance. The processing technology makes the full range of cathode materials for use in liquid and solid electrolyte-based lithium ion batteries.

Shawn Severson: Great, thank you. Let's turn to the specifics of Nano One, beginning with a general overview of your patented

processing technology and how it is different from conventional processes.

Dan Blondal: Cathode producers grind and mill lithium powder into pre-mixed powders out of the other metal ingredients. The mixed powders are heated to high temperatures in a furnace, where clumps of lithium and the other metals slowly migrate into crystalline formations to produce the desired composite ceramic cathode powder. Adding protective coatings to these powders requires additional stages of grinding, mixing and heating.

Nano One differs by mixing all the ingredients in a single water-based reaction before drying and heating in the furnace. By mixing chemically, Nano One produces a homogeneous mixture of lithium and other metals at the atomic level, forming crystal structures earlier in the process and this simplifies steps, reduces time in the furnace and eliminates waste streams. In some cases, we can start with alternative feedstocks, reducing costs even further.

Of course, there is a lot more to it, but Nano One's process can use lower cost feedstock, drive down processing costs and enable performance improvements.

Shawn Severson: Can you expand a bit on how Nano One's proprietary process was developed and provide a bit of your company's history?

Dan Blondal: Very briefly, we started from an idea in 2011 and applied for our first patents in 2013. We have had a loyal investor base and the backing of the Canadian government through proof of concept, piloting and now as we roll out our technology, we have a dozen and a half strategic interests in our pipeline including some tier one automotive companies. In 2018, we converted two of these leads to strategic partners, through testing and validation. We are working hard to sign more partners in 2019.

Shawn Severson: Let's talk specifically about how your technology makes cathode materials more affordable and improves the capacity, charge and cycling performance of lithium ion batteries. What is the real advantage here?

Dan Blondal: Let me focus specifically on lithium iron phosphate, because that is our nearest term opportunity. We mix lithium, iron, phosphate and the carbon coating in one concentrated reaction to form the desired LFP structures. We use lower cost sources of iron and phosphate than conventional methods and we use the more abundant form of lithium, namely lithium carbonate. These cost advantages help margins and competitiveness.

Our LFP process also eliminates waste streams and adds the required carbon coating without additional chemical and thermal processing steps. These are the advantages that led to the recent agreement with Pulead Technology Company in China.

Pulead is the largest supplier of LFP and they have ambitious expansion plans to address market projections of 200 kTon/yr. They have partnered with Nano One to drive down the costs through process innovation and maintain their competitive advantage.

Ultimately, Nano One's goal is to license our processing technology to Pulead and generate significant royalties.

Shawn Severson: That's a great lead-in to my next question, which is regarding your market

strategy itself. Can you talk about your licensing and JV strategy and how you plan on partnering with automotive and/or battery suppliers to take advantage of the growing cathode market?

Dan Blondal: We have near term, mid-term and long-term strategies. Our near-term strategy is LFP, as I've described. For the mid-term, we are developing additives and coatings to improve the longevity and stability of nickel, manganese and cobalt (NMC) based materials. Our longer-term project is to develop high voltage, cobalt free cathode materials for solid state batteries (Lithium manganese nickel, LMN). The mid and long-term development work will be done in collaboration with leading automotive groups and their suppliers.

In total, the cathode market is projected to be worth $23 billion and licensing into this market could generate from 1 to 5% of sales. Nano One has is first partner in place for LFP and in discussions with others. We have a pipeline of potential automotive partners for NMC and LMN which we are advancing to agreements.

Shawn Severson: Let's take a closer look at the LFP and lithium iron phosphate market and let's say that your projected costs are 10 to 30 percent below the industry average. Can you discuss a couple of the other competitive advantages for this market in particular?

Dan Blondal: Ground zero for LFP is in China and that's where we have to prove ourselves and we think we can reduce costs by 10 percent or more. Outside of China, where the supply chain is less established, we think we can disrupt with a 30 percent cost reduction. Our main advantage is sourcing the least expensive forms of lithium, iron and phosphate. But LFP also needs to be made conductive with a carbon coating, and Nano One does this without additional steps by adding its carbon source with the other ingredients. This innovation has the additional benefit of controlling particle size, which is very important to LFP.

Also, Nano One's process eliminates waste stream common to other LFP processes. We use everything in the reactor to make our LFP. There is another LFP process used outside of China, commonly known as hydro thermal. It is essentially a pressure cooker that starts with lithium hydroxide and generates one-part LFP and two parts lithium sulphate, as a waste stream that needs recycling. Hydrothermal makes high quality LFP but adds significant operating and capital expense. Nano One's process could be very advantageous to North American or European producers.

Shawn Severson: Thank you very much, Dan. Before finishing, can you talk a little bit about the technology roadmap for cathodes?

Dan Blondal: LFP will serve markets that care mostly about safety, longevity and low cost of ownership. That includes buses, fleet vehicles, entry level and mid-range EV, energy storage and is an environmentally preferred alternative to lead acid batteries.

Incentive programs in China currently favor long range and therefore NMC batteries, but these programs start disappearing in 2020 and companies that dominate this space, like BYD, believe they can further improve the range of LFP vehicles by 20-25%. Nano One believes there is a leading role for LFP to play in the global adoption of lithium ion batteries and its cathode improvements can help pave the way.

NMC will continue to serve the luxury long-range EV market, where range and brand are the key motivators. Lowering the ratio of cobalt can boost range and reduce supply chain risk but it also decreases stability and safety. So, we are likely to see compromises and lots of R&D to overcome these trade-offs. Nano One's proprietary NMC is uniquely positioned to address some of these issues and work with the automotive space is underway.

Lastly, LMN which we also refer to as high voltage spinel, is for next generation lithium-ion batteries. It operates at higher voltages with both liquid and solid electrolytes, it has no cobalt, it is low-cost and it has a very high rate of charge and discharge. Our LMN is proprietary and well positioned to address the integration challenges with next gen batteries.

We're actively developing LMN and NMC with tier 1 automotive companies and LFP with globally recognized cathode producers, so naturally, we are very excited and proud about what we have accomplished and about what is to come.

Shawn Severson: Sounds like a great subject for our next piece. Again, thank you for your time today, Dan. It's been very helpful overview for investors and I look forward to talking with you again.

Dan Blondal: Thank you very much, Shawn. It's been a pleasure speaking with you.

SHAWN SEVERSON
FOUNDING PARTNER

Mr. Severson founded *alpha*DIRECT Advisors (ADA), a division of EnergyTech Investor, LLC in 2016 after seeing a significant communication and information gap developing between small and micro-cap companies and the financial community. Mr. Severson has over 20 years of experience as a senior research analyst covering the technology and cleantech industries. Previously, he was Managing Director at the Blueshirt Group where he was the head of the Energy, Environmental and Industrial Technologies practice. Prior to the Blueshirt Group, Mr. Severson was at JMP Securities where he was a Senior Equity Research Analyst and Managing Director of the firm's Energy, Environmental & Industrial Technologies research team. Before joining JMP, he held senior positions at ThinkEquity, Robert W. Baird (London) and Raymond James. He began his career as an Equity Research Associate at Kemper Securities. He was frequently ranked as a top research analyst including one of the Wall Street Journal's "Best on the Street" stock pickers and multiple awards as Starmine's top three stock pickers.

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