

# ESG Investors look to Nano One as a connector in a sustainable future

If you follow Jack Lifton on InvestorIntel you'll have a pretty good idea that the dream of replacing all the internal combustion engines on the road today with battery electric vehicles (BEVs) is more of a fantasy than a reality based on today's technology. The demand for raw materials, in particular lithium, just doesn't add up. Jack does a great job of explaining the math in his Lithium by the numbers article from earlier this month with a follow up to hammer the point home in Lithium: The Haves and the Have Nots from last week. In summary, the first article suggests that even if lithium production doubles by 2025 (which producers say they can do), that will only get the world to roughly 10% of annual car production being BEVs. The latter article states "There is not even the remotest possibility that global lithium (measured as metal) production could grow to this week's prediction, for example, by the child-like prognosticators at Deloitte, that in 2030 32% of all newly manufactured motor vehicles would be battery electric vehicles (BEVs)."

I think it's safe to say that most reasonable people around the world agree that reducing emissions is a positive step for humanity. But how do we think as a global community that we can achieve these goals in light of some pretty serious shortfalls in the basic building blocks to making this happen? Obviously, technology has to be the answer. We have to be more efficient with the resources we've got if we want to have any chance at not only meeting the political goals of carbon reduction but also avoiding the often unwitnessed reality of destroying the earth by mining every possible resource required to achieve those goals.

The good news is that there is already a company out there working on technology to improve lithium-ion batteries. Nano One Materials Corp. (TSX: NANO) is a technology company with a patented and scalable industrial process for the production of low-cost, high-performance cathode powders used in lithium-ion batteries. These unique materials are being designed to add value to electric vehicles and grid storage batteries in the global push for a zero-emission future. Nano One's patented manufacturing technology – the "One Pot Process" – streamlines the production process and thereby reduces cost while enabling higher performance cathode materials as compared to the standard manufacturing process. Last year the Company announced the development of a coated, single crystal cathode material for lithium-ion batteries that provides up to 4 times improvement in longevity. Granted this doesn't necessarily reduce initial demand for lithium but it certainly helps to put less stress on the supply chain going forward.

With that said, last month Nano One announced three new patents issued and allowed in Canada, the US and China. Notably coverage for a novel method for phosphate stabilizing of lithium-ion battery cathodes. An important, low-cost durability improvement to lithium nickel manganese oxide (LNMO) cathode material which delivers energy and power on par with other high-performance cathodes and is more cost-effective because it is cobalt-free, low in nickel and does not require excess lithium. LNMO also has an operating voltage that is 25% higher than commercial high nickel cathodes, enabling fewer cells in applications such as power tools and electric vehicles while providing improved productivity, efficiency, thermal management and power. So no cobalt, less nickel and ultimately less lithium given you don't need as many power cells.

And then there's the other unintended consequence of moving towards a lower carbon future, the supply chain. Currently, the cathode supply chain is long and complex. Nano One

technology enables cathode materials to be manufactured directly from nickel, manganese, and cobalt metal feedstocks in the form of metal powders, metal carbonates and other salts rather than metal sulfates. Metal powders are one-fifth of the weight of metal sulfates, avoiding the added costs, energy, and environmental impact of converting to sulfate and shipping and handling of waste. Nano One's technology aligns it with the sustainability objectives of automotive companies, investment communities and governmental infrastructure initiatives. It also offers an opportunity for metals refiners to provide environmentally, and sustainably mined sources of nickel ore to integrate and manufacture cost-reduced value-added cathode powders for direct supply to battery manufacturers.

In summary, Nano One appears to have the right technology at the right time. On top of that, the Company does it all with a lower overall carbon footprint than many, if not all, of its peers. In my opinion, the latter concept still isn't valued as high as it should be given as most ESG investors appear to be focused on top line carbon impact, and rightfully so given that policymakers haven't really made it an issue yet. In the meantime, as Jack Lifton educates the world that BEVs in every driveway may be a fallacy in our lifetime utilizing current technology, here's a company that could perhaps help make it more of a reality.

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**Stock price up 275% over the  
past year, Nano One**

# progresses commercialization efforts with JV partners in the lithium ion battery industry

Battery cathode materials nanotech company, Nano One Materials Corp. (TSX: NANO) (“Nano One”) continues to make solid progress with regards to commercialization of their patented licenses via several joint development agreements. The Company has also recently been upgraded to the TSX exchange, trading under the new ticker “NANO”.

Nano One is working with some of the biggest names in the battery and EV industry

## Partnership and Collaborator Overview

### Miners & Refiners

#### Niobium Coatings



#### Other

#### Thermal Processing



### Cathode Producers

#### eLNO



#### LNMO (HVS)



Undisclosed Asian Cathode Producer

#### LFP



### EV OEMS

#### High Energy Cathodes



Undisclosed US OEM

Source: Nano One investor presentation

Nano One's recent development agreements update

Announced on April 20, 2021, Nano One reported that they had successfully advanced phases one and two of their joint development agreement (JDA) with their multi-billion-dollar Asian (outside China) cathode producer development partner. The announcement stated: "LNMO cathode materials have met performance metrics and initial economic targets. Next steps include scale up, detailed economic modeling, third-party evaluation and planning for commercialization.....The JDA provides a framework to develop a business plan for the commercialization of cathode materials, through a joint venture, licensing of Nano One's technology and or through further development work."

The key takeaway here for investors is that Nano One has developed advance intellectual property that will help cathode makers make next-generation batteries, needed to support the next generation of electric vehicles that require lower cost, faster charging, and still with good energy density and power. Nano One's high-performance lithium-nickel-manganese-oxide (LNMO) cathode materials (using Nano One's patented one-pot process) is also known as high voltage spinel (HVS). It delivers energy and power on par with other high-performance cathodes and is more cost effective because it is cobalt free, low in nickel and does not require excess lithium. LNMO's three-dimensional spinel structure enables lithium ions to flow more quickly than other types of cathode for fast charging and discharge and keeps it from expanding, contracting and straining the battery.

Announced on June 3, 2021, Nano One and Johnson Matthey entered into a joint development agreement for lithium-ion battery materials. The co-development agreement is for next generation products and processes for Johnson Matthey's eLNO® family of nickel-rich advanced cathode materials using Nano One's patented one-pot process. The agreement also includes a detailed commercialization study for pre-pilot, pilot and scaled up production.

Announced on May 6, 2021, Nano One and niobium producer CBMM entered into a co-development agreement. The project will build on CBMM's niobium products and technologies, and on Nano One's successful demonstration and patenting of niobium coated cathode materials. Niobium coatings protect the cathode which leads to long-term cycling stability and improved battery durability.

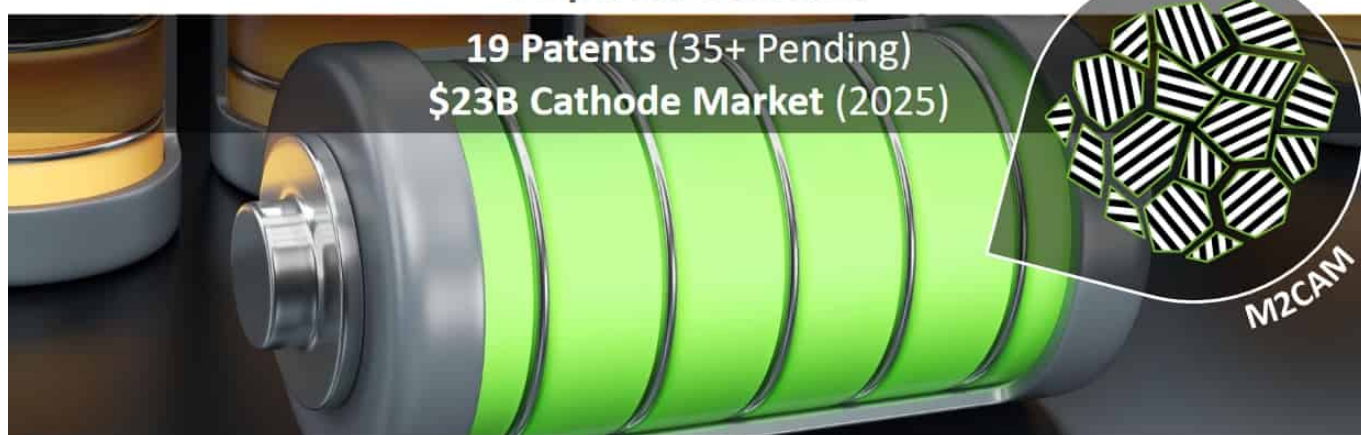
**Nano One is targeting to make US\$1B from the forecast US\$23 billion cathode market by 2025**

**nanoOne**  
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Changing How the World Makes **Battery Materials**

Corporate Overview

19 Patents (35+ Pending)  
\$23B Cathode Market (2025)



Source: Nano One investor presentation

### Closing remarks

Car makers and customers are demanding electric cars at lower prices with longer lasting and better batteries. To achieve this car makers, cathode and anode manufacturers, are spending up big on R&D and innovation. For most companies, it is easier and faster to pay a royalty to benefit from this better technology than spend billions of dollars trying to develop it themselves. The battery cathode market alone is forecast to be worth an incredible US\$23 billion by 2025, so there is plenty

of incentive to have the best technology. Nano One's goal is to target just US\$1 billion of the sector.

Nano One has done the work and is now rapidly co-developing better cathode materials to support cathode and battery manufacturers, and ultimately the EV and energy storage industries. This should potentially lead to successful commercialization and the beginning of strong revenues for Nano One.

Nano One is recently cashed up after a successful equity capital raise of C\$28.9 million and trades on a market cap of C\$436 million after a nice 275% stock price rise over the past year. There should be good times ahead for Nano One.

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## **A cleaner greener world is what Nano One Materials is all about**

The market sure liked the latest news that Nano One Materials Corp. (TSXV: NNO) received conditional approval to graduate to the Toronto Stock Exchange under a new trading symbol "NANO" as the share price was up an impressive 13% yesterday. Perhaps this reflects market interest of the exciting potential of this interesting cleantech innovator.

For starters, Nano One is a technology company with a patented process for the low cost production of high performance cathode materials used in lithium ion batteries. You know, the batteries that are going to power virtually every battery electric vehicle and store the power from all the renewable energy sources coming online along with all your portable

electronic devices. In other words, a pretty large addressable market. Nano One is in the process of showing the world that they have a better design for coating the cathode of a lithium ion battery.

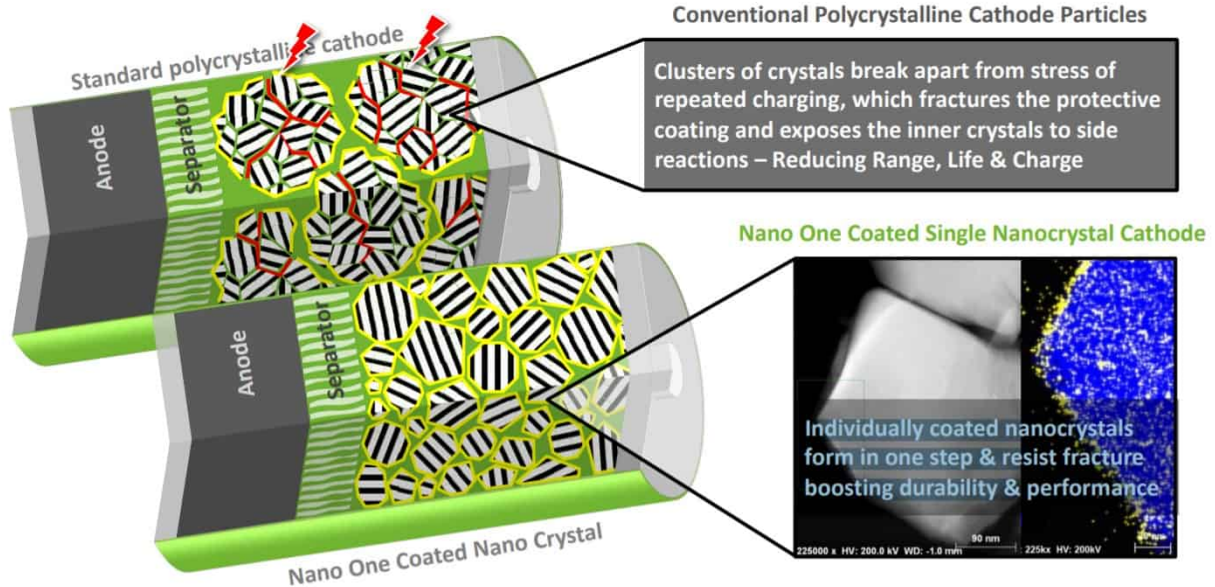
All lithium ion batteries have cathode materials and it's estimated that the cathode represents roughly 25% of the cost of the overall battery. This is where Nano One has focused on trying to reduce costs and improve efficiency. The Company's silver bullet (that's an expression, I don't think there's any silver involved) is the patented "One Pot Process" which streamlines the production process and thereby reduces cost while enabling higher performance cathode materials versus the standard manufacturing process.

Cost reduction comes from the process being able to go directly from metals (lithium, nickel, cobalt and manganese) to cathode powder without having to convert it to sulphate or in lithium's case, a hydroxide. This results in reduced costs for raw materials and energy input which in turn makes for a greener, lower carbon footprint overall. Cost savings can be several thousands of dollars per ton for cathode material.

The One Pot Process also helps on the performance side. As a battery charges and discharges, conventional polycrystalline cathode particles start to break apart from the stress of repeated charging. Over time this can fracture the protective coating and expose the inner part of the crystals to side reactions. This has the effect of reducing the range, life and charge of a battery. The Nano One process individually coats nanocrystals which form in one step and resist fracturing thus boosting durability and in turn full life cycle performance.



## Nano One – Coated Single Crystal Ni Rich NMC



[www.nanoone.ca](http://www.nanoone.ca)

Source: Nano One Materials Corporate Presentation

The technology has been proven to work on several occasions including a joint development program focused on LNMO cathode materials (lithium nickel manganese oxide) that was successfully completed with validation by a multi-billion-dollar Asian cathode material producer and in collaboration with the University of Michigan on the development of innovative solid-state battery technology, to highlight the most recent updates. As well the Company is involved in strategic partnerships with Volkswagen, an undisclosed large US auto producer, Pulead Technology Industry (a highly respected Chinese cathode producer) and Saint Gobain (a 400-year-old materials company). In February Nano One announced its M2CAM (metal to cathode active material) initiative to engage in discussions with large integrated miners to reduce environmental footprints and maximize upstream value in the global battery supply chain.

As you can see, this company ticks all the boxes for a greener, cleaner world. And the best part is, they have more than enough cash to continue ongoing research and development, pilot plant expansion, business development and strategic

initiatives having raised \$29 million at the start of April to go along with the \$30 million of working capital they finished Q1/21 with. Nano One appears to have the right solution at the right time and if the new green economy is serious about reducing its carbon footprint we all know who should be at the top of the list.

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