Nano One's cathode materials are inventing the zero-emission battery future

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Every once in a while, something that you have been working on, seemingly forever, starts to come together and that momentum starts to snowball. Today we are going to discuss a company that recently announced Q2 results with several exciting highlights that are the result of many years of hard work and determination. And although this article isn't part of the critical minerals series, this company is inextricably linked to EV batteries, the processing of critical minerals and has already received funding from the Canadian Federal Government as well as the National Research Council of Canada Industrial Research Assistance Program and is engaged in the Mines-to-Mobility initiative. And if that isn't enough of a teaser for you, their stock price has rallied over 140% since hitting its 52-week low in mid-May. It has been a solid couple of months, to say the least.

The company that has been on a pretty good roll of late is Nano One Materials Corp. (TSX: NANO), a clean technology company with a patented, scalable and low carbon intensity industrial process for the low-cost production of high-performance lithium-ion battery cathode materials. The technology is applicable to electric vehicle, energy storage, consumer electronic and next generation batteries in the global push for a zero-emission future. Nano One's One-Pot process, its coated nanocrystal materials and its Metal to Cathode Active Material (M2CAM) technologies addresses fundamental performance needs and supply chain constraints while reducing costs and carbon footprint.

The second quarter news flow began in late May with the acquisition of 100% of the shares of Johnson Matthey Battery Materials Ltd. located in Candiac, Québec. The acquisition included the team, facilities, equipment, land and other assets, with highlights of the deal being:

- A team with more than 360 years of scale-up and commercial production know-how
- Team and facilities proven in supplying tier 1 cell manufacturers for automotive
- LFP facility and land strategically located near Montréal and operational since 2012
- Facility and equipment that can serve Nano One's process needs with room to expand
- Expedites Nano One business strategy for LFP and other battery materials

The fully funded C$10.25 million deal is strategically located and has the benefit of access to a North American ecosystem that will serve the broader global community with cost-effective, resilient, and environmentally sustainable cathode materials. If you've been following my critical minerals series you'll recognize that this is an opportunistic deal that is the right asset in the right location at the right time.

Nano One quickly followed up with another, even more important (in my opinion), corporate announcement less than a week later by signing a joint development agreement (JDA) for lithium-ion battery materials with industry giant BASF. The JDA will see the companies co-develop a process with reduced by-products for commercial production of next-generation cathode active materials (CAM), based on BASF's HED™-family of advanced CAM and using Nano One's patented One-Pot process and metal direct to CAM (M2CAM®) technologies. The multi-phase agreement includes a detailed commercialization study for pre-pilot, pilot and scaled

up production. BASF, a global leader in chemistry and high-performance lithium-ion battery cathode materials, has recognized Nano One's advanced technology that has the potential to improve the product performance of BASF's high-performance CAM and further simplify the synthesis of battery materials.

And if all the above wasn't validation enough that Nano One has finally made it to the big leagues, less than 2 weeks after the BASF news the company announced a US$10 million equity investment by one of the world's largest mining companies, Rio Tinto. In addition to the investment, Rio Tinto has agreed to enter into a strategic partnership to provide iron and lithium products, all of which will accelerate Nano One's multi-cathode (multi-CAM) commercialization strategy and support cathode active materials (CAM) manufacturing in Canada for a cleaner and more efficient battery supply chain for North American and overseas markets. The collaboration agreement includes a study of Rio Tinto's battery metal products, including iron powders from the Rio Tinto Fer et Titane facility in Sorel-Tracy, Québec, as feedstock for the production of Nano One's cathode materials, which dovetails nicely with the first deal noted above.

Nano One finished Q2 with cash and cash equivalents of C$48 million, which represents roughly 14% of their C$343 million market cap. With abundant capital to deploy, plenty of tailwinds for the industry as a whole, and a team with ample experience in financing, capital growth, technology management, chemistry, engineering, materials science, batteries, and intellectual property, it seems the company is really hitting its stride. I dare say, based on the recent news flow, there could be a lot more to come from Nano One.

What's this about Johnson-Matthey exiting the EV battery cathode business?

written by Jack Lifton | August 11, 2022

The legacy carmakers and their supply base both face bankruptcy if they make the wrong decisions on entering the "transition to EVs" markets. This is because the OEM automotive industry is, along with semiconductor manufacturing, one of the most capital-intensive industries in the world. Just like with a 200,000 ton DWT ship, inertia being the problem on the one hand and prior deployment of massive amounts of capital being the issue on the other, the OEM automotive industry cannot change course in a short time, and so must be careful to choose the right path (allocation of capital) before starting the voyage.

The battery materials' *processing* markets were surprised yesterday by an unexpected announcement from the UK's most prominent technology metals' processor, Johnson-Matthey Ltd. (JM), that it was withdrawing from the battery materials' processing market due to its estimation that the return on capital from manufacturing lithium-ion battery cathodes would be too low to justify the allocation of capital required to do so. JM's stated reason for this decision was that the battery materials' business is becoming "commoditized," so that JM's hoped for competitive advantage based on its specialized cathode manufacturing technology would either not materialize or not be good enough to be competitive.

But, even if so, It is the timing of this announcement that

seems puzzling.

Both CATL, China's largest integrated battery manufacturer and Umicore, Europe's largest battery materials *processor* have poor returns on capital in their respective battery business sectors, and this has been going on since both entered the battery business, so JM cannot have been surprised by this factor, and, in fact, should have taken it into account on day one of its foray into the battery materials' business.

So, what's it all about?

Large companies with either diversified products or vertical integration can distribute costs. Legacy OEM automotive EV makers, for example, like Germany's Volkswagen, which had a 5 billion Euro profit last year, can afford to lose some money introducing its EVs to the market at a loss per vehicle, while it tests both market acceptance and the lowering of manufacturing costs due to scaling up production.

Let's set aside my continuing accounting of battery raw materials' resources as woefully insufficient to support a transition to EVs, and concentrate on the OEM automotive industry's costs of bringing a new vehicle with any type of power train to market.

It is always multi-faceted crap shoot, and the history of government intervention in the car market is not one to inspire confidence.

Designing a new car and preparing to produce it costs billions of dollars and takes 3 to 6 years.

Government intervention in this market is always a compendium of what you can't do, not what you can. The U.S. and EU government's favorite regulatory intervention in the OEM

automotive industry is the required “average miles-per-gallon” range for an OEM’s output. This “standard” was first introduced to reduce the emissions of hazardous gases and then added the reduction of the emission of particulates to its mandate. The current EV craze was actually the result of California’s 1990’s experimental legislation requiring the slow phase in of zero-emission vehicles. General Motors brought out a battery electric vehicle, the EV in the late 1990s, and Toyota introduced its “hybrid” Prius into the US (mainly California) market in 1997 to meet that mandate. The Prius, a hybrid, using, at first, a nickel-metal-hydride (the metal being a mix of rare earths) battery prospered. The EV with its lead-acid batteries and short range, 90 miles before needing a recharge, did not (It helped that GM lobbyists got California to suspend enforcement of the zero emissions mandate). GM had only leased its EVs; they were recalled and scrapped.

BEVs as a type went into hibernation until 2005 when Elon Musk decided that lithium-ion batteries were ready for prime time. Global Cooling became Global Warming and then Climate Change, and Musk’s struggling, capital devouring, OEM automotive venture, Tesla, kickstarted a revival of a serious EV industry, something last seen by the great grandfathers of Detroit’s, Wolfsburg’s, Paris’, and Tokyo’s car industry leaders when they decided that Thomas Edison’s Nickel-iron batteries were not practical for even their then short range motor cars. They knew that Rockefeller’s gasoline and kerosene distribution system in “filling stations” was far more practical than Edison’s expensive and hard to maintain DC generating stations except for trolley cars.

So, what’s this got to do with JM’s decision to pull out of the battery cathode business?

The answer is that JM has (correctly) concluded that the market,

though large, is limited, and that very large profitable multi-product and/or vertically integrated or (whisper) state-supported companies are already driving prices down by competition to get market share.

JM has concluded, again correctly, that most of the cars and trucks manufactured for the next generation will use internal combustion engines and that its core automotive exhaust emission catalytic converter business based on its dominance in the processing and use of platinum group metals is where it has the best competitive advantage and sunk costs.

The reputed costs to JM associated with building a Poland sited cathode plant were twice the industry average.

JM was once also in the rare earth processing business, and it exited that in the 1980s when the first Molycorp was losing its dominance to Chinese low-cost competitors. That was a wise decision then, and getting out of the lithium-ion battery cathode business before getting into massive non-recoverable debt is also a wise decision.

Finally, I would like to repeat my prediction that since the OEM automotive assemblers do not understand or want to understand that the manufacturing of EVs using lithium-ion batteries is limited by the availability of lithium, there will be a cull. The survivors will be those OEMs that can balance the production of their allocation of (raw materials' supply limited) EVs with ICE production profitably. BMW is my choice for the most likely survivor, because it has already announced that it will continue to produce a mix of powertrain choices in its vehicles. The rest, so far, are either going "all-electric" or eliminating ICE production and development. They chose poorly.

Stock price up 275% over the past year, Nano One progresses commercialization efforts with JV partners in the lithium ion battery industry

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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

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

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.