

Nano One Launches Groundbreaking M2CAM Technology to Reduce Cost, Waste and Carbon Footprint in Lithium-Ion Battery Supply Chain

February 26, 2021 (Source) – Nano One® Materials Corp. (**TSXV: NNO**) (**OTC: NNOMF**) (**FSE: LBMB**) (“Nano One”), a technology company with a patented and scalable industrial process for the production of low cost, high performance cathode materials used in lithium-ion batteries, today announced its M2CAM (metal to cathode active material) initiative. Nano One’s patented One-Pot process has been successfully adapted for M2CAM, enabling cathode materials to be made direct from metal using nickel, manganese and cobalt metal powder feedstocks rather than metal sulfates or other salts.

Nano One is actively engaged in a number of discussions with large integrated miners to reduce environmental footprints and maximize upstream value in the global battery supply chain. Nano One’s other collaborators include automotive OEMs with similar motivations to meet environmental targets by reducing waste, carbon emissions, logistics and costs.

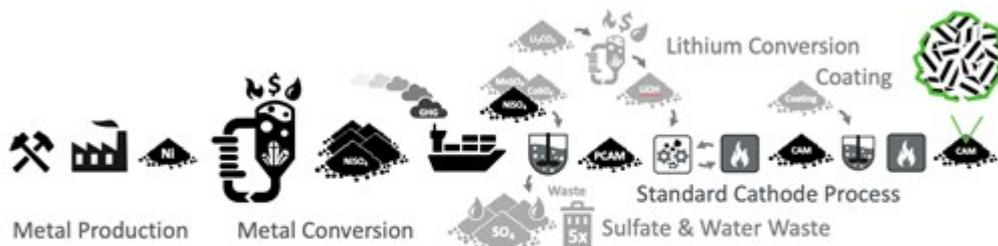
Patents are pending for M2CAM and preliminary test results are showing battery capacity up to 5% higher than cathode materials currently made from metal salts. Nano One CTO Dr. Stephen Campbell will be presenting on Nickel and M2CAM at the BMO 30th Global Metals & Mining Conference on March 1, 2021.

This innovation addresses a growing ESG (environmental social

governance) imperative to reduce cost, waste, energy and carbon footprint in the lithium-ion battery supply chain. Nano One's innovative one-pot process:

- eliminates the need for costly and energy-intensive conversion of nickel, cobalt and manganese to sulfate, and lithium carbonate to hydroxide,
- eliminates the shipment of large quantities of water and sulfur, lowering energy, emissions and costs of shipping by 4-5x,
- eliminates the costly extra step of making precursor cathode active material (PCAM),
- eliminates the economic and environmental cost of handling a waste stream of sulfur and water that is 4-5x larger than the cathode product stream,
- combines feedstock conversion, precursor formation, lithiation and coating steps using carbon neutral chemistry in a patented one-pot process, and
- forms durable single crystal cathode powders and protective coatings simultaneously.

Robert Morris, Nano One's Battery Metals Strategy Advisor and former Executive Vice-President of Sales and Marketing in Base Metals for Vale remarks, *"Miners are compelled to reduce their carbon footprint, both from internal corporate ESG mandates and in meeting customer requirements, none more so than those in the battery supply chain. OEM's want 'clean nickel' and that refers to the mining, refining and logistics of getting the product to the place where it will be consumed. Metal producers should have an ESG and premium advantage over sulfate and other non-metal producers, if their nickel can be used directly in the production of cathode materials."*

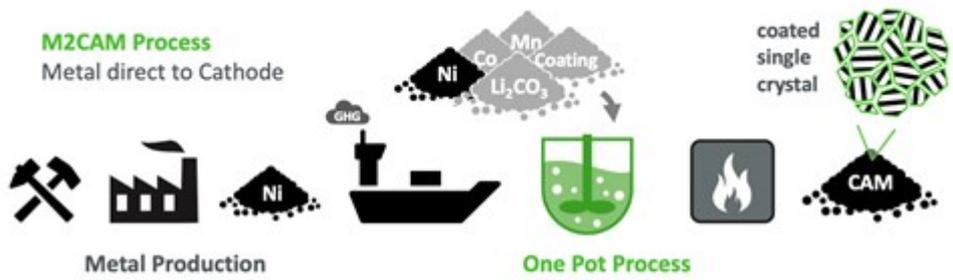


Cathode Active Material (CAM) supply chain is long and costly with significant environmental footprint.

CAM Supply Chain – Image

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Miners and refiners use a costly and energy-intensive crystallization process to convert nickel, for example, into nickel sulfate ($\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$, 22% nickel, 78% waste) which weighs 4-5x more, before shipping to manufacturers. The metal sulfates are then mixed in a caustic process to form an intermediate precursor while generating 4-5x waste in sulfate and water. Lithium hydroxide (LiOH) is then added to the precursor in a prolonged thermal process to form the cathode powders before the final protective coatings can be applied. This supply chain is long and complicated with energy, carbon emissions, environmental waste, complexity, cost, logistics, shipping, and margins added at each stage.



Nano One's Patented **One-Pot Process** and **M2CAM** enables cathode materials (CAM) to be made direct from metal by combining metal and lithium conversion, PCAM, CAM and coating into one reaction, eliminating the economic and environmental cost of metal sulfates and lithium hydroxide.

M2CAM Process – Image

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Nano One's patented One-Pot process forms durable single crystal cathode powders and protective coatings simultaneously and M2CAM enables these materials to be made directly from metal powders. 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. The One-Pot process is an aqueous process, using carbon neutral chemistry, that operates at room-temperature and atmospheric pressures, and it combines feedstock conversion, precursor formation, lithiation and coating steps into one reaction. This creates added value for metals and aligns Nano One with the environmental, sustainability and cost objectives of automotive companies, miners, investment communities and governmental infrastructure initiatives.

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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 to optimize its technology across a range of 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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