

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

AMMTO & IEDO JOINT PEER REVIEW

May 16th-18th, 2023

Washington, D.C.

Commercially Viable Process for Surface Conditioning of High-Nickel Low-Cobalt Cathodes | AMMTO

Feng Wang,¹ Zonghai Chen,¹ Natalya Chernova,² Brad Prevel,³ Shailesh Upreti ² ¹ Argonne National Laboratory; ² C4V LLC; ³ Primet Precision Materials Inc. Contract Numbers: 37420/2.1.0.447; 37422/2.1.0.499 Oct. 1, 2020 – Sept. 30, 2022

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Target: Advanced automotive batteries containing higher nickel (Ni) cathode.

Primary innovations: Source agnostic process technology for Cathode powder manufacturing.

Impact: This project would serve to accelerate the scaling of a **domestic clean cathode manufacturing technology**, thereby reducing **supply chain risk**.







Team: making electrification available & affordable!

Largest Gigafactory in the North-Eastern United States



1+ GWh Per Annum

150 acres Huron Campus Area

100 +Al-driven robots



6 Seconds

Average time to make one battery cell

2023 In Commercial Production

Commercialization Roadmap

A True Home Grown Industrialization Solution



Project highly aligned with C4V's technology and manufacturing roadmap

Background & Strategic Approach



Results and Achievements

Upscaled the surface conditioning process (up to 500g)



Results and Achievements

Established an interfacial engineering technology: a wet impregnation process to convert detrimental impurities into beneficial surface coating on CAMs











Low-cost, low waste

comparable performance as those from precursors by coprecipitation

→ open new opportunities for manufacturing with feedstock from domestic supply chain

Future Work, Technology Transfer, & Impact

Future Work:

• Scale up the process for pilot-scale production of CAMs, using feedstocks from recycled/scraped batteries and other domestic supply chain.

Technology Transfer:

 The developed process technologies will be transferred directly to our partners for large-scale production of CAMs using the pre-existing manufacturing plant and Gigafactory.

Impact:

• The EERE supported partnership now aiming to head towards domestic clean cathode manufacturing, thus reducing supply chain risk.

Summary



- 1. <u>Project</u>: Commercially Viable Process for Surface Conditioning of High-Nickel Low-Cobalt Cathodes
- 2. Developing domestic green and cost-efficient CAM manufacturing for C4V's enabled Li-ion cell gigafactories supported by domestic supply chain to invigorate US manufacturing toward net zero.

Current Project: Scaled Up

Surface NMC Modification to 500 g (MRL 4)

Primet's NanoScission NMC Precursors to 500 g (MRL 5)

Near-term:

10-100 kg, applying for DE-FOA-0002864

Future: mega-ton production for iM3NY and other C4V's gigafactories

3. AMMTO role aligns with C4V's motto "Innovating Molecules to Machines"



Questions!



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