

NAATBatt 2020 Member Update: Forge Nano

James Trevey Ph.D
Chief Technology Officer



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Company

Forge Nano and ALD NanoSolutions combine forces making atomic level manufacturing a reality



NEWS PROVIDED BY
Forge Nano Inc. →
Feb 06, 2020, 13:00 ET

LOUISVILLE, Colo., Feb. 6, 2020 /PRNewswire
Forge Nano and ALD NanoSolutions merge
to market.

DOE 301 Congressional Notification Table

Home » DOE 301 Congressional Notification Table

Table of Awards, DE-FOA-0001980, Advanced Manufacturing Office FY20 Multi-topic Funding Opportunity

Forge Nano	Reducing the Cost and Energy of Lithium-ion Battery Manufacturing using High Throughput Atomic Layer Deposition Processes	Louisville, Colorado	Topic 1, Subtopic 1.2: Innovative Manufacturing Processes for Battery Energy Storage	\$5,026,584	\$6,283,334
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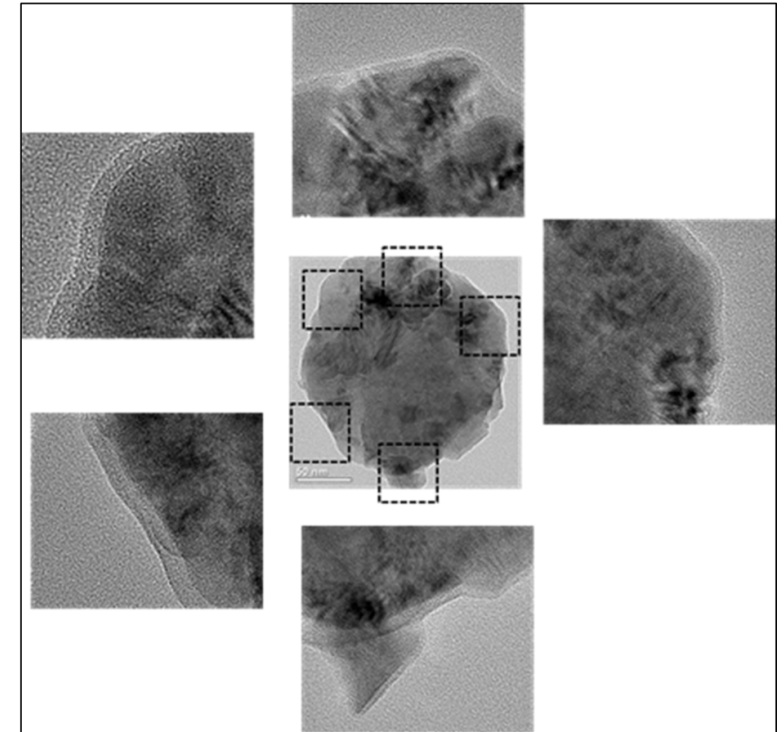
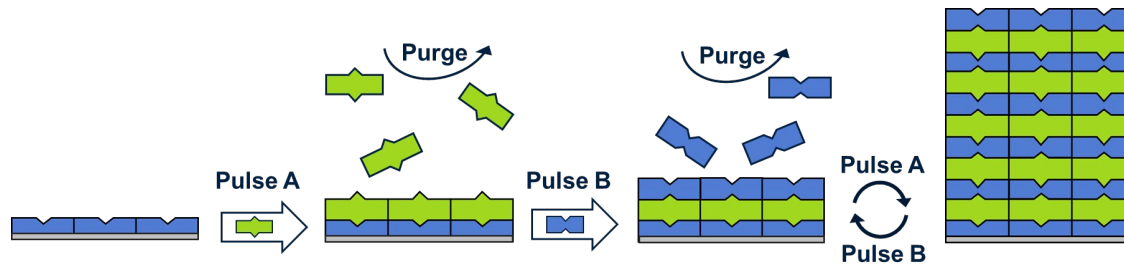
- Founded in 2013
- 43 Employees
- Headquarters in Louisville, CO

Mission:

To become the world leader of innovative materials solutions

Atomic Layer Deposition

ALD for anything, not just semi-conductor
Coatings that are conformal and uniform
Coating thickness typically 0.1nm-100nm
Nearly any chemistry can be deposited

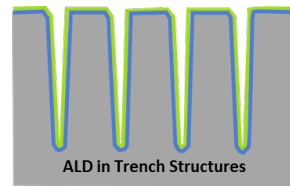
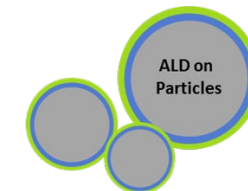
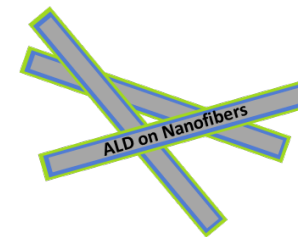


End-to-End Material Solutions Provider

R&D Services (fee for service)

Toll-Coating (milligrams to kilotons)

Equipment Sales (Lab to Commercial-Scale)



Reactions happen at the surface of materials, we can control the surface

Application Space for ALD



Energy Storage

LIB, Beyond Li,
Capacitors, Materials

Catalysts

Emissions,
Chemicals, Fuel Cells

Fillers

Thermal, Optical,
Electrical, Mechanical

Powder Forming

3D Printing, Powder
Metallurgy, Ceramics

Separations

Adsorbents,
Membranes

Space

Multi-faceted,
Cross-cutting

Textiles

Anti-microbial,
Special Properties

Cosmetics

Processing,
Performance

Structural

Composites,
Building, Glass

Pharma

Controlled Release,
Processing

Medical Devices

Biocompatibility,
Energy Storage

Lubricants

Tribology, Rheology,
Dry & Wet Lubricants

Barrier Coatings

Corrosion, Anti-
fouling, Wettability

Pigments

Paint, Dispersion,
Optical Properties

Power Gen

Solar

Displays

LCD, OLED, QLED



ALD is applicable to just about anything

Energy Density



Power Density



Cycle Life



Safety



Cost



Old News (Data Available upon request)

- Li-ion, beyond Li-ion, Na, Zn, Pb, ect...
- NMC, NCA, LMNO, LCO, LMO, Sulfur
- Solid electrolytes, separators
- Graphite, Si, composites, Li-metal
- Conductive additives, cases, components

New News

- Core innovation
- Comprehensive technology base
- Strong patent portfolio

ALD improves performance and safety, and can actually reduce cost

Notable Development Activity



Coming soon

Coming soon



Nouryon



ALD nanosolutions

MITSUI
KINZOKU



U.S. DEPARTMENT OF
ENERGY | Energy Efficiency &
Renewable Energy
ADVANCED MANUFACTURING OFFICE

Commercially Ready Products



Lab-scale: ~1 mg to 1 kg



Argonne
NATIONAL LABORATORY



Lab-scale: Objects/Inert



PicoShield® LCO
PicoShield® Natural Graphite

Forge Nano is the largest and most comprehensive ALD provider

Thank you!



James Trevey Ph.D
jtrevey@forgenano.com

Daniel Higgs Ph.D
dhiggs@forgenano.com