

LITHOS

COMMERCIAL SCALE ROTARY BATCH SYSTEM 100 -10,000 kg Blender Batch

Manufacturing ALD coated particles requires the combination of robust industry-standard material handling with a cutting edge ALD process. Forge Nano has spent the last decade designing and building a suite of the world's most advanced and reliable particle ALD reactor systems. We use these high-quality systems everyday to process development lots for global customers and now offer this same capability to commercial customers.



Forge Nano's LITHOS Rotary Blender Reactor System combines industry expertise in rotary particle handling with a deep understanding of ALD, resulting in an easy-to-use, flexible, and reliable production system. Forge Nano's system is designed to coat each particle with unrivaled thickness and conformity control, while minimizing or eliminating particle agglomeration. Our production machines are customizable and built to order, ensuring the optimal solution for each customer.

ALD-enabled particle material equipment

Rooted in scalable particle handling technology, our systems are customized for your lot size & product line:

- Pharmaceuticals
- Energy Materials
- Catalysts
- Powdered Metals
- Encapsulation
- Modified Interfaces

Global leader in ALD on particles

For over fifteen years, we have collaborated with R&D teams to innovate advanced materials. Our global partners have leveraged our materials development for commercial production, to benefit consumers at scale.

LITHOS COMMERCIAL SCALE ROTARY BATCH SYSTEM

100 -10,000 kg Blender Batch

Production Blender Reactor System Specification

Power Processing Volume	50-500L (up to 1000+kg)
Maximum number for ALD cycles	Unlimited
Maximum Reactor Temperature	200 °C or 400 °C
<i>In-situ</i> Mass Spectrometer (Residual Gas Analyzer)	Interfaces with custom control software to automate coatings on powders
Precursor Delivery Cabinet	Up to 4 different precursors (Two sources standard)
Powder Loading/Unloading	Manual, gravity dump (automated options available)
Process Line and Valve Temperatures	Up to 200 °C
Particle Handling	Multi-mode rotary including proprietary particle handling aids
Software/Controls	Recipe-based proprietary software with automated feedback control
Complete System Dimensions	~3m x 2m x 3m

Optional Additions

Precursor Automated Refill Station	Automatically refills smaller delivery cabinet reservoirs from bulk distribution unit for minimal downtime
Drum Handling/Loading Mechanism	Provides assisted drum loading/unloading
Additional Material Handling Equipment	Powder pumps, collection hoppers, or bulk bag loaders can be integrated into the system installation
Consumables and Likely Spares Package	Includes common consumables and spare parts
Regulatory Compliance	NRTL Field Certification Available

Proprietary Process Automation

Each system comes with our proprietary software and controls. This technology was developed over years of refinement for creating ALD-enabled products at gram, kilogram and ton scales. This includes our in-situ mass spectrometry, which helps precisely control precursor dosing and ALD film thickness growth and is recommended for all our systems.

Forge Nano has developed proprietary pilot-scale and commercial-scale reactors that produce ALD-coated materials for customers today. We support the integration and operation of this equipment at our customers' advanced materials production facilities. Our Fortune 500 customers have validated coating consistency across our research, pilot and commercial systems, including our continuous vibrating reactor system that can process over 12,000 kg of powder per day.

Forge Nano is a leading materials science company harnessing the power of Atomic Armor, the company's proprietary ALD nanocoating technology, to accelerate manufacturing innovation, transform product performance and achieve a more sustainable future for a range of industries around the world. Atomic Armor produces superior coatings that can unlock a material's performance at the atomic level and deliver custom solutions from small-scale R&D and laboratory work to large-scale, high-volume production lines.

Forge Nano puts the world's leading Atomic Layer Depositions authorities at your fingertips. Contact our experts to learn about this breakthrough in materials science.

www.forgenano.com