

APOLLO

HIGH THROUGHPUT WAFER COATING SYSTEM

APOLLO provides fully automatic cassette-to-cassette ALD processes with high throughput performance at the lowest cost of ownership. APOLLO leads in every aspect of ALD productivity, performance, cost, and sets a new standard for efficiency while reducing environmental impact. With its 'zero-waste' processing, APOLLO lowers factory power consumption and occupies a smaller footprint on the clean-room floor.



Key Features

- Ultra fast deposition 120-300 Å/min
- Maintenance at of 250 µm
- Zero-Waste & Long pump life
- Up to 90% precursor utilization
- Small footprint: 1 m² per chamber
- Fully interlocked fault-safe
- Uniformity within 1% wafer and batches

Applications

- Eliminate hermetic packaging
- Encapsulation for environmental, corrosion, and high voltage insulation
- Electronic devices
- PCBs, CoBs, ICs and modules
- Medical devices and sensors
- Optical Sensors

Forge Nano is delivering APOLLO around the world to enable a new generation of advanced technologies. APOLLO features best in class maintenance and world class service, from our dedicated team of US based engineers and scientists.

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Basic specifications and configurations

Performance:

APOLLO reaches new heights of ALD productivity with outstanding chemical utilization, lowest cost of ownership, and highest throughput manufacturing capability. Forge Nano's patented SMFD-ALD™ process ensures quality of films and nanolaminates.

Capabilities:

Cost-effective ALD of films including HfO_2 , ZrO_2 , Ta_2O_5 , Al_2O_3 , ZnO , ZnAlO , SiO_2 , HfSiO , TiO_2 , $<300\text{ C TiN}$, BN , GaN , Nb_3N_5 and more. Covering challenging patterned wafers such as advanced-generation DRAM device wafers with $>50\text{X}$ enhanced area.

- Thick film deposition (>5 micron)
- Low temperature processing (down to $80\text{ }^\circ\text{C}$)
- 100% conformal films over any topology
- Seamless incorporation of nanolaminates with reproducible atomic-layer control
- Composite ternary and quaternary alloy films

APOLLO allows seamless and reproducible film engineering with nanolaminate and composite capabilities. Film adhesion in excess of 1000 PSI to many different substrates including tin, gold, copper, FR4, polyimides, many solder mask materials, polyurethanes, ceramics, adhesives and more.

Configuration:

APOLLO accommodates wafer sizes from 75mm up to 200mm with single-wafer loader or cassette to cassette configurations.

Design:

APOLLO uses our millisecond response ALD manifold that integrates 10 of our patented Fast Pneumatic Valves (FPV) to deliver over 100 million trouble-free cycles of composite and nanolaminate ALD films. This manifold is the only ALD manifold that can switch composition every cycle without any throughput penalty. Field proven since 2005, our valves set records for speed, reliability, lifetime and safety, while performing at temperatures as high as $220\text{ }^\circ\text{C}$. Forge Nano's ALD valves are the only doubly contained, spill-free UHP valves on the market.

Chemistry:

Effective and well-controlled vapor delivery from proprietary, innovative sources enable fast, cost-effective deposition of films requiring low-volatility precursors. Additional proprietary and innovative on-demand sources are used for safe control and delivery of otherwise short-lived or exceedingly reactive reactants.

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.

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