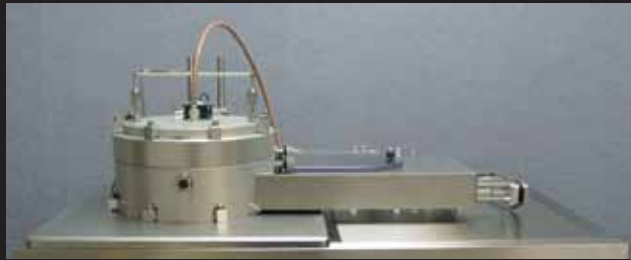


Atomic Layer Deposition Systems



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NANO-MASTER Atomic Layer Deposition Systems

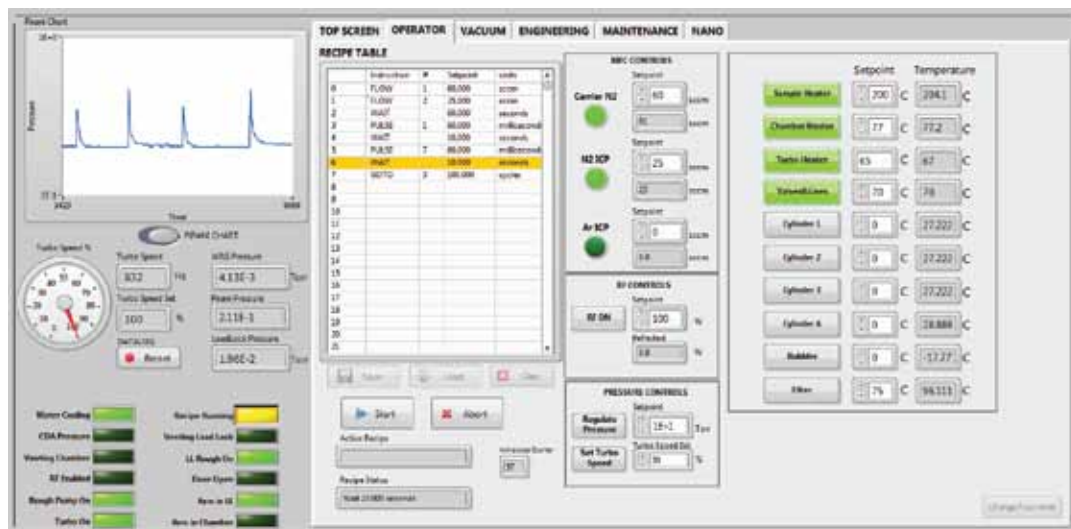


NLD-4000 with ICP Source and Auto Load/Unload

Atomic Layer Deposition is an important technique for depositing thin films for a variety of applications. ALD is able to meet the needs for precise thickness control and conformal deposition in high aspect ratio structures to a level that far exceeds other deposition techniques. The nature of the sequential, self-limiting surface reactions in ALD produces a non statistical deposition because the randomness of the precursor flux is not a factor. As a result, ALD films remain extremely smooth, continuous, and pin-hole free allowing for excellent film properties. ALD processing can also be scaled to very large substrates.

The NLD-4000 is a stand alone, PC controlled ALD system with LabVIEW software featuring four levels password-controlled user authorization. The system is fully automated and safety-interlocked and offers flexibility to deposit multiple films (ex. Al_2O_3 , AlN , TiN , ZrO_2 , LaO_2 , HfO_2) for Semiconductor, Photovoltaic and MEMS applications. It has a 12" aluminum reaction chamber with heated walls and a pneumatically lifted top for easy chamber access and cleaning. The system features an onboard gas pod containing up to seven heated 50cc cylinders for precursors and reactants with fast-pulse heated delivery valves using N_2 or Ar as a carrier gas.

Unreacted precursor can be managed with a heated filter on the chamber exhaust port. All heater set points are PID controlled. Automatic PC control of recipes, temperatures, flows, pumpdown/vent cycles, and delivery line flushing. Options include automatic load-unload (without changing system footprint), planar ICP source with remote plasma for Plasma Enhanced ALD (Planar ICP geometry maintains a small reaction chamber volume, speeding up cycle times), turbomolecular pump for faster cycles and a lower base pressure.



NLD-4000 Software in Automatic Recipe Mode

NANO-MASTER Atomic Layer Deposition Systems

FEATURES

- Less than 1Å uniformity
- 13" aluminum compact chamber for fast cycle time and throughput
- Up to 8" substrate
- Heated chamber walls
- 400°C substrate heater
- 10^{-7} torr base pressure
- Onboard precursor glovebox
- Up to seven 50cc precursor cylinders
- 300 l/sec maglev turbomolecular pumping package
- Fast pulse heated gas delivery valves
- Large area filter to capture unreacted precursors
- Heated stop valve to increase precursor residence time for high aspect ratio structure coating
- 26" x 44" footprint with enclosed panels ideal for clean rooms
- PC based fully automatic recipe driven control system
- State of the art user interface designed to easily program pulse loops with loop-within-a-loop capability
- EMO protection and safety interlocks

OPTIONS

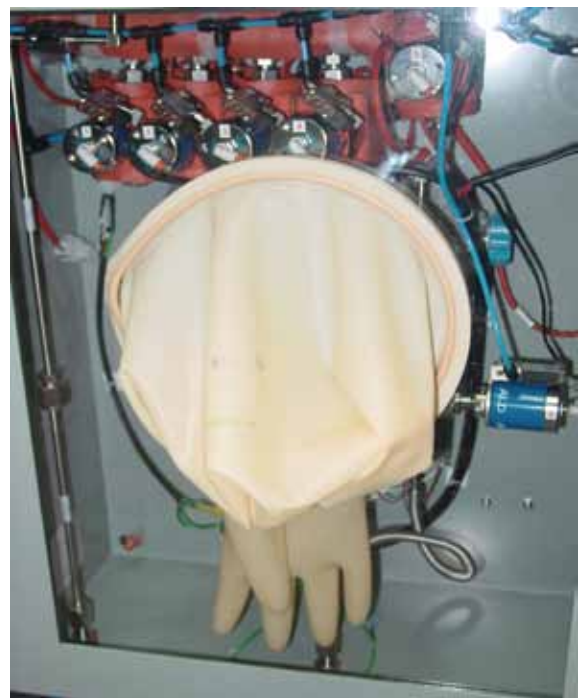
- Downstream planar inductively coupled remote plasma source for PE-ALD process
- Auto load/unload
- Additional precursors
- Bubblers

APPLICATIONS

- High-k dielectrics
- Hydrophobic coating
- Pinhole-free passivation layers
- High aspect ratio diffusion barriers for Cu interconnects
- Highly conformal coatings for micro fluidics applications
- Fuel cells, e.g. single metal coating for catalyst layers



Chamber with ICP Source



Precursor Glove Box

NANO-MASTER Atomic Layer Depositon Systems

GENERAL SPECIFICATIONS

Maximum Substrate Size:	8"
Substrate Temperature Range:	Up to 400°C
Gas Lines:	Heated and Electropolished
Precursors:	Up to 7 Precursor/Reactant Cylinders
MFC's:	2 Standard, Extras Optional
Plasma Enhanced ALD:	Downstream ICP (Optional)
System Control:	PC Controlled with LabVIEW and Touchscreen User Interface
Loading and Unloading:	Automatic (Optional)

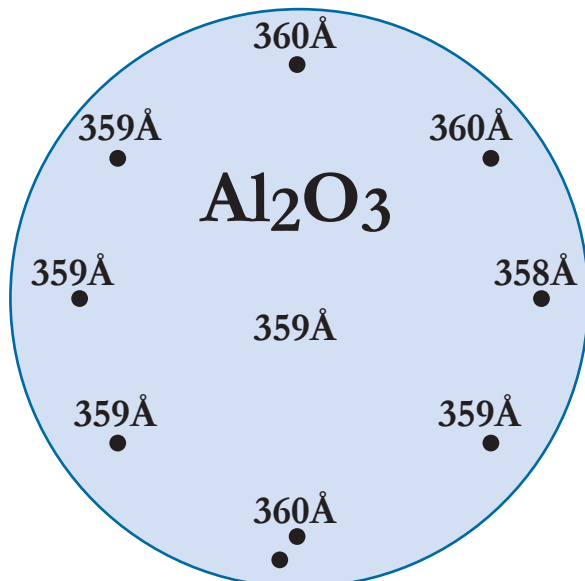
FACILITY REQUIREMENTS

Power Input:	208V/380V/415V, 20A/Phase, 50/60Hz
Chilled Water:	2gpm @ 50psi, 18°C
Compressed Air:	1/4" Swagelok, 80-90 PSI
Processed Gas:	1/4" Swagelok, 20 PSIG
Nitrogen:	1/4" Swagelok, 10 PSIG
Exhaust (System):	NW25

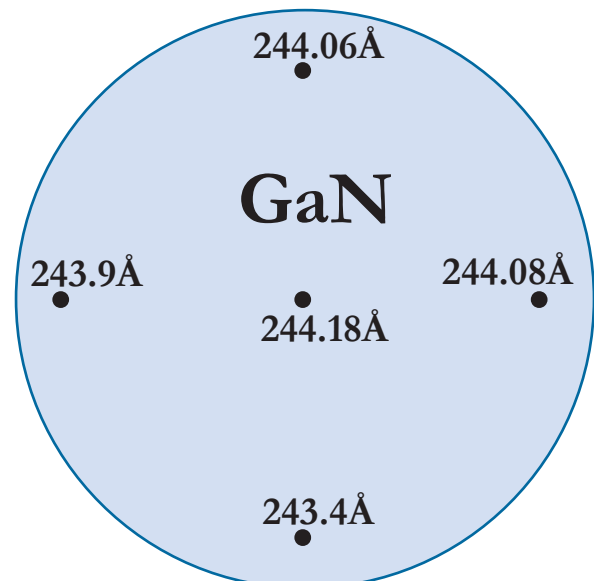
DIMENSIONS

NLD-4000	Width	Depth	Height
	26"	44"	44"

NLD-4000 Uniformity Data on 6" Wafer



Cycles: 300
(TMA + H₂O)
Uniformity: 0.27%



Cycles: 150
(GaCl₃ + N₂ Plasma)
Uniformity: 0.3%