GemStar-6™ Benchtop ALD System

Molecular Innovation™

The GEMStar-6 benchtop ALD system is designed to meet the challenges of uniform, conformal, thin-film depositions over high aspect ratio features, on a broad range of substrates, in a compact, economical package.

A small, lightweight machine for heavyweight R&D efforts, GEMStar makes optimal use of lab space and research budgets.

ARRADIANCE® GEMStar ALD systems deposit metal, semiconductor and insulating films with superior electrical and barrier properties. They are designed for uniform, conformal films on planar and high aspect ratio structures on a broad range of substrates.

Some key features of GEMStar include:

- Small (31"x24"x12") footprint and benchtop design allow for easy placement in any lab environment
- Chamber accommodates up to 6" (150mm) diameter wafers or 3D objects up to 1.35" (34mm) tall or micro/nano scale powders.
- Up to 300°C hot wall design with convective heating to achieve ±1°C temperature uniformity across the substrate.
- Exposure control is critical for conformal ALD films on high aspect ratio structures. Partial pressure and residence times are precisely controlled with a downstream vacuum valve.
- Standard set of 8 ALD precursors can be run concurrently, enabling a variety of thin films and multi-component film stacks.
- Standard 6 precursor bottles, including 2 heated (4 heated optional) up to 140°C for low vapor pressure precursors.
- Single inert gas assist line for ultra low vapor pressure precursor.
- Up to 150°C dual zone heated gas manifolds.
- Showerhead gas delivery with a horizontal linear array of injectors insures uniform gas distribution over the entire substrate holder.
- Double-sealed, differentially pumped chamber eliminates ambient leakage during sensitive metal depositions.
- Standard 2.75" CF port allows attachment of optional QCM or particle holder.

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GEMStar Operational Control

Precise films require state-of-the-art controls. The Arradiance System maintains complete control over key deposition parameters such as temperatures, exposure, pulse, purge, background pressure.

Precursor temperature is precisely controlled with increasing temperature from bottle to manifold to reaction chamber, insuring no condensation of gases in the precursor lines.

Metalorganic and oxidizer/reducer precursors are mounted on separate manifolds, increasing the lifetime of valves and eliminating film growth on manifold walls.

Quick flow manifold and high conductance foreline yield fast purge and fast cycle times.

High speed ALD valves ensure precise precursor dosage.

Internal GEMStar USB control module.

User created and saved recipes allow flexibility and batch-to-batch consistency.

Diagnostic system logging creates traceable data of all system parameters during all runs.

Easy Maintenance

Simplified system maintenance results from:

The modular system design allows for easy swapping out parts for service and cleaning, with minimal down time.

Convenient benchtop access from the top and back to critical parts, precursor bottles, vacuum, power and gas connections.

Exhaust gases are flowed through a thermal decomposition trap prior to the vacuum pump.

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System Specifications	
Substrate size	Up to 6" (150mm) wafer or square substrate Up to 1.35" (34mm) tall 3D solids, or a stack of 9 wafers Standard 6" (150mm) diameter end effector
System Dimensions (w x d x h)	31" x 24" x 12" (79cm x 61cm x 31cm) – fits on standard desktop or lab bench
System Weight	125 lbs
Chamber surface area/volume	160 in^2 / 80 in^3 (1030 cm^2 / 1310 cm^3)
Deposition Modes	Dynamic flow with front and back exposure for <100:1 aspect ratio deposition Static flow for >100:1 aspect ratio deposition
Substrate Temperature	25°C – 300°C < ± 1°C up to 6" wafer
Deposition Uniformity	< ± 1 % within wafer (Al_2O_3 from TMA and H_2O) < ± 2 % batch-to-batch (Al_2O_3 from TMA and H_2O)
Control System	GEMFlow™ software suite, Windows® 7 based, advanced and basic GUIs Import/export of Excel compatible recipes and data Internal GEMStar USB control module
Shell / Cabinet	Tool removable top panel with rear facilities interface CF 2.75" metrology interface
System Options	Pump package with Thermal Abatement unit for exhaust gases Ozone Generator module Particle Coater
Precursor Specifications	
Precursor Handling	8 precursors standard (4 metalorganics, 4 oxidizers/reducers) 2 heated sources standard (up to 4 optional)
Inert gas vapor pressure assist	1 metallorganic source with inert gas assist for ultra low vapor pressure precursors
ALD Valves	2-way high speed ALD valves integrated into quick purge manifold
Precursor Bottles	6 removable 150cc bottles with individual shut off valves
Precursor Thermal Control	Heating jackets for precursor bottles with temperatures up to 140°C ± 1°C
Manifold Thermal Control	2 Manifold zones with temperatures up to 150°C ± 1°C
Carrier/Venting Gas	Script settable high speed MFC 0–200 sccm
Facilities Requirements Specifications (see documentation)	
Gases	80 ± 5 psi regulated clean dry air (1/4" Swagelok) 20 ± 5 psi High purity N_2 (>99.999%); N_2 purifier recommended 20 ± 5 psi, 2 standard Process Gas ports
Power	IEC C19 20 Amp AC plug/connector 110 – 120 VAC; 50/60 Hz; 20 Amps
Vacuum	Recommended 2-stage, rotary vane vacuum pump; >12 cfm pump capacity NWKF 25 sized foreline

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