Pioneer 120 Advanced Pulsed Laser Deposition System

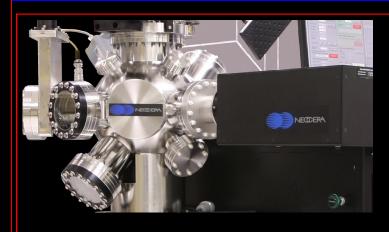


- Stand-alone turn-key PLD System.
- Deposition of epitaxial films, multilayer heterostructures and Superlattices.
- Deposition of nanoscale thin films using *insitu* RHEED diagnostics.
- Oxygen compatibility for oxide film depositions.
- Upgrades: Load-lock, Laser Heater, RF/DC Sputtering, Combinatorial PLD,
- Integration with XPS and ARPES UHV Cluster tools.



10 000 Virginia Manor Road Beltsville, Maryland 20705, USA. Phone: (+1) 301-210-1010, FAX:(+1) 301-210-1042 www.neocera.com

Pioneer 120 Advanced Pulsed Laser Deposition System







ubstrate Back-side Temperature Target Setpoint Percent Power Mode	0 0 0 0.0 Auto	Multiple Step Heating Program	Automatic Reset / Shut-off Ramp Down Heater(s) After Time Remaining 00.00:00 Automatically Tum Off Turbo Heater When Done No	Engage Abort
Control Type Setpoint 🚽 Ramp Rate 🚽 % Power Output 🚽 Status		Start Abort % Reset Controller	Turbe Heater (Pfeiffer) Control Heater Status Off Heater (001) On	Update
ubstrate Front-sid Temperature	e Heater Control		Chamber Bakeout Heater Control Temperature 0 Target Setpoint 0	
Control Type Setpoint Ramp Rate Status	Ramp Rate Temperature	Start Abort Reset Controller	Control Type Ramp Rate Temperat Setpoint 9 0 Ramp Rate 9 20.0 deg/m	Abort

Deposition Chamber

- 12" diameter spherical chamber
- 4.5" CF UV grade silica laser port.
- 4.5" CF port for RHEED gun.
- 6" CF port for RHEED screen.
- 6" CF pumping port.
- 6" CF port (for RF / DC Sputtering)
- 2.75" CF port for vacuum gauge.
- 8" CF port for substrate heater stage.
- 8" CF port for target carousel stage.
- Additional 2.75" and 1.33" CF ports.
- Access door on hinges (non-UHV).

Programmable Radiative Substrate Heater

- Substrate temperature: 850°C (max).
- Substrate rotation:1-30 RPM (360° substrate rotation, compatible with future RHEED upgrade.
- Substrate size: 2-inch diameter (max), minimum dimension : 10 x10 mm².
- Substrate sizes compatible with future load-lock upgrade.
- Heater temperature is controlled by a programmable PID controller
- Heater is oxygen compatible up to 1 atmosphere of oxygen.
- Heater is top-mounted with substrate surface facing and parallel to ground.
- Pre-ablation shutter is included.
- K-type thermocouple provides input to the PID controller.
- The controller is integrated with Neocera System software (Labview 2013).



Pioneer 120 Advanced Pulsed Laser Deposition System



- Target indexing, target rastering and target rotation are controlled by Lab-VIEW 2013 software, facilitating multilayers and superlattice depositions.
- Software controls external triggering of the laser-facilitates nano-scale thin film growth control.
- Software provides continuous composition spread of binary and ternary phase spreads (optional).

Multi-target Carousel

- Six 1-inch diameter targets or three 2-inch diameter targets.
- Target rotation, 360 degrees continuous (1-20 RPM).
- Target rastering (max 100 degrees/ sec) for uniform ablation over the entire target surface.
- Target indexing for multilayers.
- Target height is adjustable (manual adjustability
- Target shield protects targets from cross-contamination.
- Ideal for depositing epitaxial films, multilayers and superlattices.
- Unique target rastering protocol. Unique carousel design will facilitate Continuous Composition Spreads/ Combinatorial PLD.

Motor Has Been Home Home Target or Angle Specific Angle Desired Angle 0.0 Raster Type Specific Angle Start Angle 0.0 Raster Motor End Angle O	d 0.0 Rotate 0.0 Stop Motor rget AC Rotation Motor	
Motor Has Been Homed Home Target or Angle Specific Angle Desired Angle 00 Raster Type Specific Angle Start Angle 00 End Angle 00 End Angle 00 Control The Target or Angle Control The Target or Angle Control The Target or Angle 00	ed Enable d 0.0 Rotate 0.0 Stop Motor rget AC Rotation Motor	
Target or Angle Desired Angle (deg) Specific Angle 0.0 Move to Desired Target or Angle 0.0 Rotation Specific (deg/sec) Raster Type Specific Angle 0.0 Raster Motor Actual Specific (deg/sec) Start Angle 0.0 0.0 Raster Motor Start Angle 0.0 0.0 Control The Tar Rotation Motor Postive Raster 2.00 0.0 Control The Tar Rotation Motor	d 0.0 Rotate 0.0 Stop Motor rget AC Rotation Motor	
Desired Angle () 0.0 larget of Angle (eggsec) Raster Type Specific Angle (eggsec) Start Angle () 0.0 Raster Motor End Angle () 0.0 Control The Tar Positive Raster () 0.0 Control The Tar Positive Raster () 0.0 Control The Tar	rget AC Rotation Motor	
Raster Type Specific Angle Raster Motor Start Angle 0.0 0.0 End Angle 0.0 0.0 Negative Raster 0.0 0.0 Positive Raster 0.0 0.0 Velocity 0.0 0.0	rget AC Rotation Motor	
End Angle 00 Negative Raster 00 Positive Raster 00 Velocity 0 Velocity 0 Control The Tai		20
Positive Raster 0.0 Rotation Motor		
Velocity (1) 10.0		
	Stop Rotation	
Manual Rotation 0 0 Engage Pushbutton Control		_
Spin Speed	Positional Offsets Save Change	es
Keep "Motor Has Been Homed" While Spinning at Constant Velocity	• () 60.0 60.0 • () 120.0 120.0	
Target Carousel Motor Feedback		
Position (deg) 0.0 Target Siz	Empty	
Malasily (destant)	der and Can 2 3	
Accept a T Empty Holo Cannot Acc		4
Target Carousel Home Offset	jet	
Home Offset -2.5 -2.5 Save Carousel (deg) 2 Inch Targ	et 6 5	
Reset Controller/ Motor Controller Enabled O Clear Error Motor Protection Program Activated	Done	

Vacuum Pumping Package

- All-dry vacuum pumps:Turbomolecular pump backed by dry mechanical pump.
- Minimum base pressure: 8 x 10⁻⁸ Torr in standard PLD systems, 5 x 10⁻⁹ Torr in UHV PLD systems.
- Turbo-speed is controlled by software.

Pressure Measurement and Control

- Wide range vacuum gauges for pressure measurement from atmosphere to $5 \ge 10^{-9}$ Torr.
- MKS Mass Flow Controllers are integrated with PLD System software. Flow rate~100 SCCM for Oxygen.
- Closed loop deposition-pressure control.

Vacuum Control						_ 0			
Turbopump Operations Contro	1			Additional Feedback					
Actual Rotation Speed (309)	0 Hz		Operating Hours (314)	0	Hours				
Final Rotation Speed - TMP (315)	0 Hz		Operating Hours - TMP (311)	0	Hours				
Percentage of Max. Speed (707)	50.0 %		Oil Deficiency (301)	No					
TMP Speed Control (026)	Final Rot. Speed	Final Rot. Speed	Update	Motor Current (310)	0.0	Amps			
Set Rotation Speed (308)	1000	0 Hz	Update	Software Version (312)	0				
Pumping Station Control (028)	Computer	Panel	Update	Cycle Counter (319)	0				
Pumping Station Status (010)	On	Off	Update	Error Reporting					
Op. Mode Backing Pump (025)	Intermittent	Non-Stop	Update	Acknowledge Error 🤇	Ack.				
Standby (002)	On	Off	Update	Error Code (303)					
T				Past Error Code 1 (360)					
Turbopump Vent Control Venting Mode (030)	Do Not Vent	Automatic		Past Error Code 2 (361)					
				Past Error Code 3 (362)					
Venting Frequency (720)	3 40	40 %	Update	Past Error Code 4 (363)					
Venting Time (721)	6	6 Sec	Update	Past Error Code 5 (364)					
				Past Error Code 6 (365)					
Run-Up Time / Switchpoint Co	Past Error Code 7 (366)								
Run-Up Time Monitoring (004)	On	Off	Update	Past Error Code 8 (367)					
Maximum Run-up Time (700)	3	1 Min	Update	Past Error Code 9 (368)					
Rotation Speed Switchpoint (701)	50	50 %	Update	Past Error Code 10 (369)					
Command Status Ready to accept command Communicating with Vacuum Controllier									



P120 Advanced PLD System with Laser heater



PLD System Software

- Windows 7, LabVIEW 2013
- Controls substrate heating stage.
- Controls target carousel stage.
- Controls vacuum pumping stage.
- Controls Mass Flow Controllers.
- External laser triggering.
- Optional process automation.

PLD System Utilities:

- Power: 110/220V, 20A, 1 Phase.
- Water: 1 gallon/minute at 20C.

PLD Optics Package (KrF Excimer Laser)

- 45° and 22.5° degree Laser Mirrors for 248nm.
- Plano-convex Lens for 248nm. The focal length is approximately 50 cm.
- Adjustable Aperture.
- Anodized aluminum breadboard for mounting optics.
- Stable kinematic mounts for laser mirrors and lens with maximum clear aperture and wide angular range.
- A complete set of mounting rods, base plates.
- Light-tight enclosure to protect users from laser radiation.



For further information, please contact: sales@neocera.com or +1-301-210-1010, ext 104