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Solid-Source ECR Plasma Deposition System

AFTEX-6000 series

A solid-source electron cyclotron resonance (ECR) plasma deposition system forms high-quality thin films by directly reacting a low-pressure, high-density ECR plasma flow with particles sputtered from a solid source (target) placed at the outlet of the plasma flow. AFTEX-6200 is equipped with two ECR plasma sources and enables automatic transfer and deposition, which is optimal for multilayer film deposition.



Product Features

- 3" tray automatic conveyor. Five trays can be set.
- High-throughput processing of deposition on five trays in sequence, with no fall in the plasma
- High-vacuum support by three-chamber system
- Two branch-coupler-type ECR plasma sources, suitable for mass-production
- Fully automatic conveying and multi-layer deposition, up to maximum of 22 layers
- New electrical system
Detailed display of error information / Larger operations screen / Recipe back-up function, etc
- optional data logging system
Vdc plotter / New spectral system that enables measurement of film thickness and refractive index variance within the deposition chamber / Additional magnetron sputtering sources (maximum 2) / Additional gas lines (maximum 2)

Membranes and multi-layer films of wide range of materials: Any solid material that can be fabricated into a sputtering target can be used as the raw material, so films of various oxides and nitrides can be formed, as well as multi-layer films, by combining them with introduced gases such as oxygen or nitrogen. For example, if Si is used as the solid source, it is possible to form single-layer and multi-layer films of SiO_2 , Si_3N_4 , and Si.

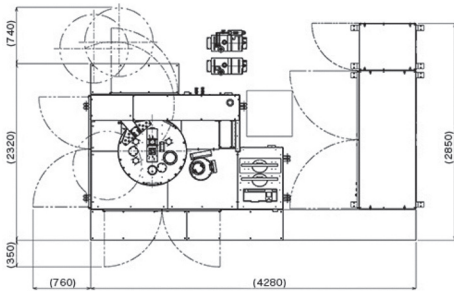
High refractive index control: Since there are direct reactions between a solid source and an oxygen or nitrogen ECR plasma flow, high-refractive index control is possible, with no generation of intermediate products as happens with CVD. In addition, films having any desired refractive index can be created simply by making oxygen and nitrogen flow simultaneously.

High-reactivity deposition: Rapid deposition is enabled by reactions between a solid source and a large-current ECR plasma of a gas such as oxygen or nitrogen.

Low-temperature, low-damage, surface cleaning effect: Deposition is by the ion-assist effect at a low energy but high current, making it possible to form high-quality, highly crystalline thin films at low temperatures and with low levels of damage, in comparison with conventional deposition methods. Cleaning of the substrate and grown surfaces can also be expected.

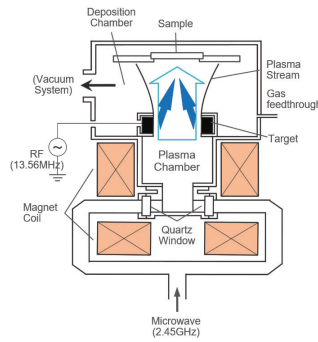
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Dimensional Drawing



▲ For more details

Conceptual Diagram



▲ For more details

Standard Specification

Item	Specifications	
Achieved pressure	Processing chamber: Max. 3×10^{-5} Pa Load lock chamber: Max. 3×10^{-4} Pa	
Vacuum exhaust system	Deposition chamber: turbo molecular pump, 1300L/sec Load lock chamber: turbo molecular pump	
Deposition chamber	Deposition chamber	Microwave branch-coupler-type ECR ion sources: 2
	Substrate holder	Flat step rotation Substrate size: Max. 3"
	Substrate heating	Maximum 400 °C
	Substrate position	Distance from target to substrate: 170 mm
Load lock chamber	Conveyor method	Automatic tray conveying, 5 trays processed together
	Number of samples	Load lock chamber: 5 trays can be set
ECR sputtering source	Quantity	2
	Plasma source	Microwave branch-coupler-type ECR plasma source
	Plasma chamber	Internal diameter 150 mm, water-cooled jacket structure
	Cylindrical target	Cylindrical, internal diameter 100 mm x width 40 mm, backing tube, direct cooling system
Gas introduction lines	Mass-flow controller: 3 lines Gases: argon, oxygen, nitrogen	

Item	Specifications	
Operations	Exhaust	Automatic
	Substrate conveying	Automatic
	Deposition	Automatic/manual (switchable)
Deposition control power sources	For ECR ion source	Microwave power sources (2): 2.45 GHz, 1kW Coil power sources (2): DC 1.5 kW (2)
	For ECR sputtering	Target power sources (2): RF 13.56 MHz, 1 kW
Utilities	Space	5.5 x 3.5 m (including work space)
	Electrical power	Three-phase, 200 V, 50/60 Hz, 35 KVA
	Coolant water	Flow rate: 20 V/min Water pressure: 0.3 to 0.4 MPa
	Weight	2000kg

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