SEKI TECHNOTRON CORP.

AX5000 - *Premier* CVD Tool for Materials Research

Overview

The AX5000 is a versatile tool for CVD deposition of materials. The equipment combines the best features of **Microwave**, **RF** and **DC** technologies to enable unprecedented control over deposition parameters and exceptionally wide experimental parameter space. New materials and processes are being successfully developed using this equipment by over 100 research teams worldwide (Please see our extensive bibliography of published results).

The equipment provides the following featured benefits:

- ✓ Thermal CVD over 4" wafers
- ✓ Plasma enhanced CVD
- ✓ Substrate heating and biasing, diagnostic ports, cold wall chemistry

Substrate holder

The substrate holder provides motorized Z-motion position control and holds 4" diameter standard silicon wafers enabling convenient integration with semiconductor processing technology such as in MEMS, and nanoelectronics.

Reactor Chamber

The reactor comprises of a water-cooled double walled steel chamber. The wall remains at room temperature during high power deposition processes. In contrast to traditional thermal CVD reactors, wall reactions remain largely irrelevant in deposition chemistry. This makes for simpler interpretation and better control of the deposit properties by externally controllable parameters. The chamber is equipped with 6 ports. Two are angled to view the substrate at 45 degrees for ease of implementation of in-situ optical diagnostic techniques e.g. laser interferometry, elipsometry, Raman spectroscopy.

Reliable RF Induction heater

The 4" diameter sophisticated RF auto-matching substrate heater provides up to 900C uniform heating without plasma assistance. With plasma, substrate temperature can exceed 1300C. Such high temperatures have already proven useful in high crystallinity carbon nanotubes and high growth rate single crystal diamond deposition. Optional water cooled (unheated) stage is available for high microwave power operation.

Microwave Plasma

ASTeX microwave technology is world known for reliable high power density plasma operation (1KW-100KW). Available high power density ensures high dissociation and extremely high radical fluxes to the substrate. Oxygen, Nitrogen , Argon, Silane, Ammonia. Methane, CO_2, CO, and Helium plasma have all been successfully utilized in creating novel films and nanotubes, wires and rods contributing to outstanding developments in materials science. Power supply options are 1.5KW or 5KW.

Substrate Bias (optional)

Substrate bias provides up to 600V negative substrate potential relative to the plasma. Ions from the plasma are accelerated towards the substrate. Substrate bias has proven useful in alignment of carbon nanotubes and rods and for enhanced nucleation rates and preferential orientation of CVD diamond and contributed to understanding of nucleation phenomena.

Options List:

- RF Heated or Water cooled Stage
- 5KW or 1.5KW microwave supply
- Turbo pump
- Substrate DC bias
- Two color fiber optic IR pyrometer.

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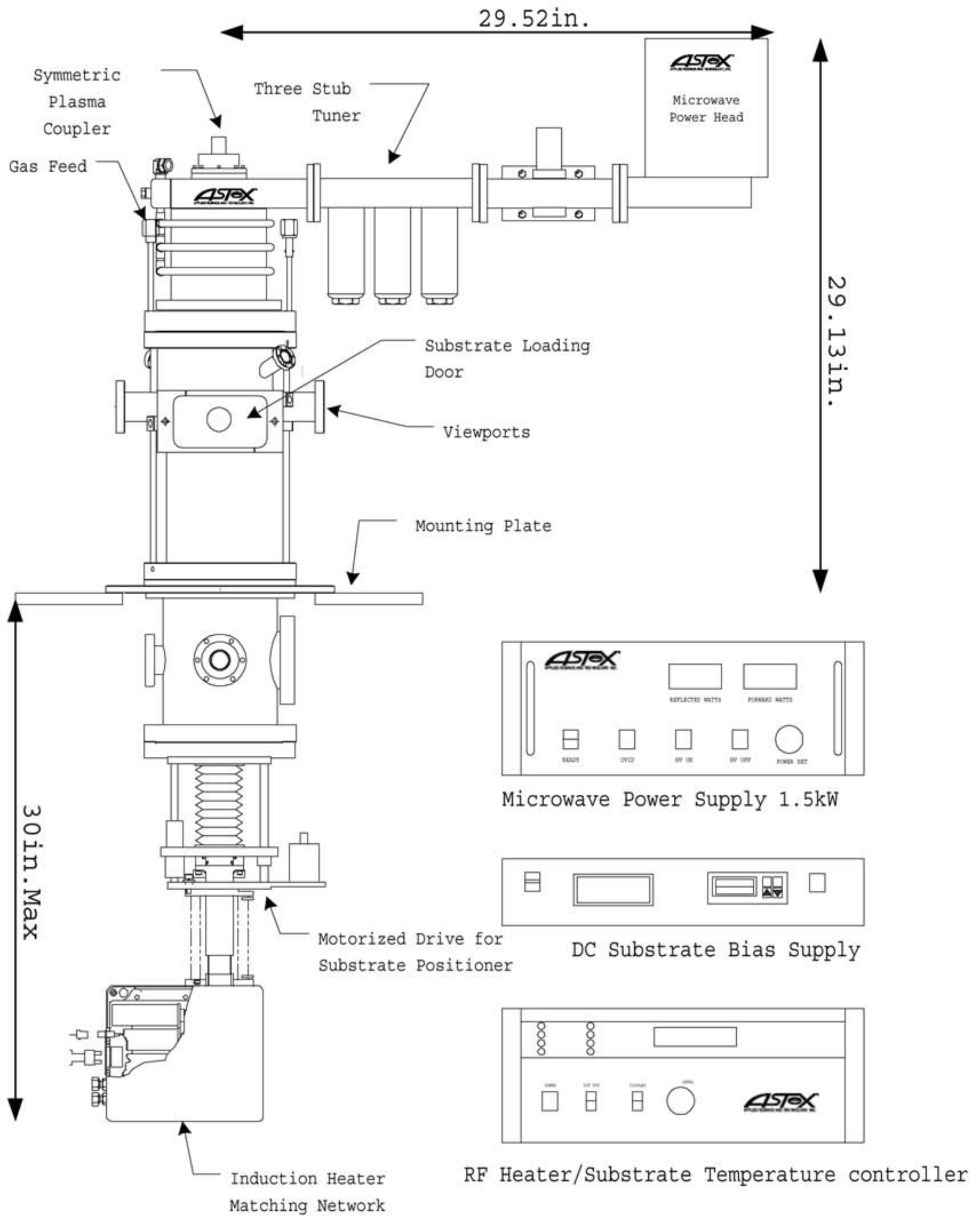
AX5000 CVD Reactor

Specification

Description:	Plasma discharge chamber, microwave power source and Wave-guide components, Variable position substrate heater with power Supply and controller
Microwave Power:	1.5kW , variable output form 20% to 100% of rating.
Frequency:	2.45GHz.
Power Display:	Forward and Reflect with digital display , ±1W resolution
Microwave Power Stability:	0.1%, after warm up.
Ripple:	1% maximum
Input Power:	208VAC, three phase, 50/60Hz, 15A service required.
Microwave Window:	4.75in. diameter quartz, replaceable, all metal seal
Chamber Size:	5.78in. inside diameter, 13in. high.
Chamber Material:	Electro polished 300 series stainless steel, high vacuum construction.
Mounting:	50lb with microwave components (excluding power generator) installed.
Chamber Cooling:	Water-cooled jacket, 0.5 to 0.75 gal/min at approximately 60psig differential.
Substrate Loading:	Substrate are load through a 2.06in.X 4.13in Door.
Diagnostic Ports:	Three 2.75in. Conflat flanges located at midplane of reactor section and Two mini Conflat flanges at slant.
Substrate Size	up to 2in.
Substrate Heater Stage:	4.0 in. diameter, induction heater graphite substrate stage, for >900℃ operation (dependent on plasma conditions), provide with closed loop feedback PID control. Digital display of vertical position of substrate in the reactor chamber. Position adjustable over 3.0 in. range.
Heater Power Supply:	Output 3.5kW 208VAC, three phase, 50/60Hz, 20A
Heater Coil cooling:	0.2gal/min at approximately 60psig differential. Closed loop system recommended.
Susceptor Bias:	Up to 100VDC, BNC input connector. (Up to 300VDC option)


29.52in.
Microwave Power Head
Symmetric Plasma Coupler
Three Stub Tuner
Gas Feed
29.13in.
Substrate Loading Door
Viewports
Mounting Plate
Microwave Power Supply 1.5kW
30in.Max
DC Substrate Bias Supply
Motorized Drive for Substrate Positioner
RF Heater/Substrate Temperature controller
Induction Heater Matching Network