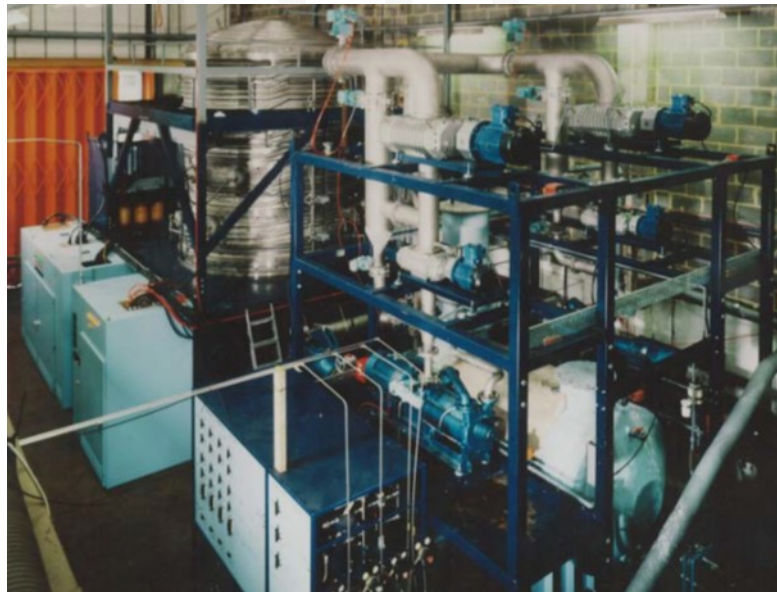


Technical Specification of CVD Machines—HT5159

CVD/CVI Reactor for SiC and C

The HT 5159 is designed for the CVD/CVI of silicon carbide and carbon. It has a rotating platform to permit the overall coating of parts weighing up to 400kg in a single cycle. A PLC control system runs the cycle without any operator intervention. The all carbon, working zone is suitable for operation up to 1,600oC at pressures between 1 and 100mbar.



Overview

The reactor is contained within a water-cooled stainless steel vacuum vessel. The internal graphite working chamber is heated by 5 graphite resistance heaters, working as 3 independent zones, each controlled by a 2-color pyrometer. The thermal insulation is provided by carbon fibre.

The reactor is suitable for the CVD of SiC and C on large single objects or many small objects. Several types of jig are available to permit the coating of components on all surfaces.

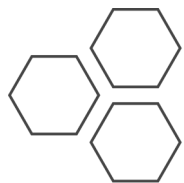
The reactor is also suitable for the isothermal isobaric CVI of SiC and C. The reactive gases are admitted into the chamber at 16 separate inlets. These flows are controlled in groups to ensure uniform gas distribution over the working zone.

The reactor is evacuated by two sets of pumps working in parallel. Each set consists of a liquid ring pump with two mechanical booster pumps.

The booster pumps have by-passes so that a number of different pump combinations can be run. This permits the reactor to be run with a wide range of gas inputs over a wide range of pressures. Automatic pressure control is achieved by a motorised valve in the vacuum line.

The effluent gas is passed to a wet scrubbing unit, which neutralises the gas before releasing it to the atmosphere.

The control system is supervised by a PC, which will run complete cycles without any operator intervention. Active mimic screens indicate the progress of the process. All processes parameters are monitored and any variation beyond chosen limits initiates a safe shut down procedure. The control system is normally installed remote from the rest of the system for increased safety.



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Specification

Criteria	Specification
Reactor Overall Dimensions	6m x 10m x 6m(high) + height above for loading
Reactor Working Zone	1300 diameter x 1490mm top loading
Temperature Range	900-1600°C
Temperature Control	5 resistance heaters combined in 3 PID zones
Temperature Measurement	2-colour pyrometer (1 per zone)
Pressure Range	1-100 mbar (standard control range)
Pressure Measurement	Absolute pressure transducer
Feed Gases	H ₂ , Ar, CH ₄
Gas Inlets	14 inlets arranged in 3 independent zones
Feed Liquids	SiCl ₄ , CH ₃ SiCl ₃
Flow Control	22 Gas Mass flow controllers + 4 liquid MFCs
Vacuum Pumps	Liquid ring vacuum pump - 500m ³ /hr Mechanical booster pump 1 - 1,000m ³ /hr Mechanical booster pump 2 - 5,000m ³ /hr Automatic pressure control by servo controlled line valve.
Materials of Construction	Vacuum vessel - 316 stainless steel Heater - graphite Reactor inner chamber - graphite Thermal insulation - carbon fibre
Electricity	500KVA (3-phase)
Cooling Water	350litre/min
Compressed Air	100 p.s.i. small amount for actuators
Effluent Scrubber	Wet scrubbing column with 5,000L tank. Continuous pH monitoring & control.

CVD / CVI Processes

BCl₃ + NH₃ BN + HCl

CH₃SiCl₃ SiC + HCl



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