K1050X

RF Plasma Etcher / Asher / Cleaner

A 100W RF plasma barrel reactor
with 110mm Ø x 190mm chamber

The K1050X features:

- Compact bench top design
- Micro-controller: fully programmable by the operator
- Fully automatic operation
- Modern solid state 100W RF power supply
- Automatic tuning of forward and reflected power
- LCD display (vacuum, RF power, elapsed time)
- Convenient drawer type specimen stage
- Two gas flow meters
- Pump-down to predetermined vacuum
- Vent control - minimal specimen disturbance

Quorum Technologies

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K1050X RF Plasma Etcher/Asher/Cleaner

Compact, automated bench top design...
The K1050X is a modern, solid-state RF plasma barrel reactor designed to meet the requirements of research and development and some small-scale production processes for a wide range of plasma etching, ashing and cleaning applications.

Robust, durable construction...
Ideal for extended ashing cycles – the K1050X features automatic microprocessor control and offers durability and simplicity of operation. Barrel systems plasma etch or plasma ash isotropically (in all directions) and are suitable for a wide range of applications.

A dry, low temperature process...
The K1050X uses a low pressure, RF-induced gaseous discharge to modify specimen surfaces or remove material in a controlled way. A significant advantage over alternative methods is that RF plasma processes are dry (no wet chemicals are needed) and also take place at relatively low temperatures.

Multiple applications...
A wide range of surface modification methods are available, using a variety of process gases. Using oxygen (or air) as the process gas, the molecules disassociate into chemically active atoms and molecules. The resulting 'combustion' by products from the interaction with the substrate are carried away in the gas stream by the vacuum system.

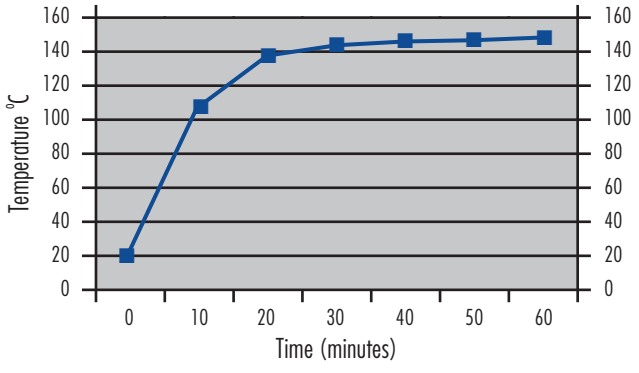
APPLICATION EXAMPLE

Low temperature plasma ashing of coal...
The K1050X can be used to remove the organic content from coal, leaving a residue of mineral and volatile components for subsequent analysis. The advantage of low temperature RF plasma ashing over other methods, such as heating in a muffle furnace (typically at 700°C), is that many more of the volatile components are retained.

In the following experiment oxygen gas was used with a forward power setting of 100W. A thermocouple was introduced into the chamber via a vacuum feed through in the rear of the K1050X process chamber. The thermocouple was fixed with high temperature resistant tape to the base of a glass Petri dish and covered with approximately 5g of coal granules of approximately 1-2mm^3 in size, covering the thermocouple tip to a depth of 1.5mm.

After one hour it was apparent that the temperature had reached a maximum 150°C.

K1050X: typical time / temperature during ashing of coal



Main features

Chamber, specimen handling and gas control

The K1050X has a 110mm diameter x 155mm deep borosilicate glass chamber horizontally mounted with a convenient slide-out specimen drawer and viewing window. Evacuation of the chamber is achieved by an optional 50L/m rotary vacuum pump. Ingress of reactive gases is controlled by two built-in flow-meters backed by solenoid valves.

NB: For applications where borosilicate glass needs to be avoided, the K1050X can be fitted with an optional quartz chamber (EK4222).

Power, tuning and vacuum monitoring

RF power of up to 100W at 13.56MHz is available and can be infinitely controlled and pre-set to required values. Automatic tuning of forward and reflected power is standard. Forward power and vacuum levels are shown by the digital display.

Automated microprocessor control

The K1050X is fully automatic. Control parameters for time, power and vacuum are easy to preset and can be monitored and adjusted throughout the process run.

'Autotuning' of RF power for optimum control and reproducibility

During the plasma process the 'autotune' facility ensures that the RF power is automatically impedance-matched to any variation in the system or loading. This means conditions in the chamber are always maintained at their optimum – important as it gives faster reaction times, greater reproducibility of results and protects the power supply during the RF cycle.

Pumping options

A working system requires only the addition of a specified rotary pump. A fomblinised rotary pump (EK3176) is strongly recommended for safety reasons when applications involve the use of oxygen as a process gas. Where oil based rotary pumps need to be avoided, dry pumping options are available.

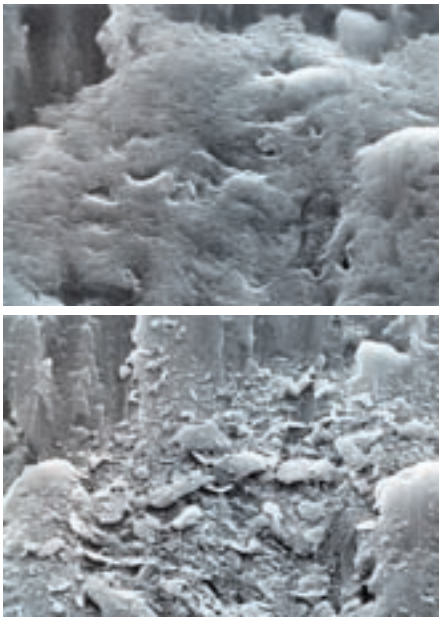
K1050T

A turbomolecular-pumped version is available – please contact us for further information.

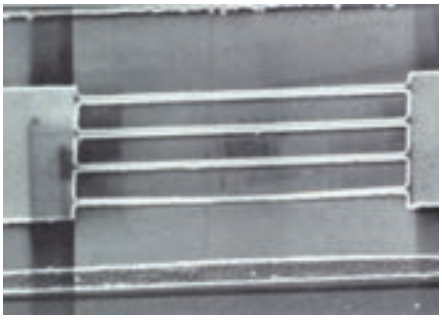
Applications

- Asbestos and man-made mineral fibre detection
- Plasma etching, eg: the removal of photoresist and epi-layers
- Low temperature plasma ashing of organic materials (eg epoxy resins, filters, foodstuff, etc.)
- Surface treatment of plastics for hydrophobic/hydrophilic conversion
- Improving painting and inking characteristics of plastics
- Plasma etching and plasma ashing of organic specimens for SEM and TEM examination
- Plasma cleaning SEM, TEM and SPM parts

APPLICATION EXAMPLES



These two SEM micrographs show before and after results comparing identical areas of a metal photo litho plate on which extraneous lines can be visualised. Treatment in a barrel plasma reactor, with oxygen as the process gas, removed the ink - which is essentially a carbon pigment in a binder - without disturbing anything that was present underneath. Subsequent SEM examination shows a scattering of particulate material made up of irregular platelets 0.2 to 2μm in diameter. X-ray microanalysis gave a spectrum characteristic of a clay mineral.



This SEM micrograph shows a set of free-standing single crystal silicon wires for studying thermal transport. The wires were fabricated in silicon-on-insulator material using electron beam lithography and CF_4 plasma etching in a barrel reactor. The wires are 40μm long, 1μm wide and 0.5 μm thick and are suspended above a silicon substrate. (Image courtesy of the Microelectronics Research Centre, Cavendish Laboratory, University of Cambridge).

The K1050X process chamber:
Far: Chamber drawer and specimen holder
Centre: During operation
Below: View into chamber during operation

Ordering Information

NB: for a full quotation please contact us, or our local distributor.

EK3158	K1050X RF plasma barrel reactor (rotary pump also required – see Optional Accessories)
EK3161	K1050XT RF plasma barrel reactor with built in 50L/s turbomolecular pump (rotary pump also required – see Optional Accessories)

Optional Accessories

EK3176	Edwards RV3 50L/m fomblinised rotary pump with oil mist filter (recommended)
EK3171	Edwards XDS5 scroll pump
EK4221	Capacitance manometer Reactive process gases, such as CF_4, significantly reduce the life of the standard Pirani vacuum gauge. A capacitance manometer is resistant to reactive gases and is essential for such processes
EK4222	Quartz chamber and door (replaces the standard borosilicate chamber and door)

K1050X Specification

Instrument case:	450mm W x 350mm D x 300mm H Weight: 25kg
Work chamber:	Borosilicate glass 110mm Ø x 160mm D
Rack out drawer:	Sliding draw assembly with specimen holder tray
Plasma output:	100W RF power supply
Vacuum gauge:	Active gauge head with full operating vacuum range display (atmosphere to $1x10^{-5}$mbar. Normal operating vacuum 0.5mbar to 1.0mbar)
Timer:	Displays elapsed process time. Various ranges can be selected with a maximum time of 99.99 hours with automatic termination of the plasma process
Dual gas flow gauges:	Dual gas needle valve flow control, selectable for either or both gases
Electrical supply:	230V/50Hz (5A maximum including pump), 115V/60Hz (10A maximum including pump)
Services:	Process gas at nominal 5psi (0.33bar)
Vacuum pump:	Requires a rotary pump with a capacity of 50L/m or greater. A fomblinised version is recommend for oxygen gas applications (see EK3176 50L/m fomblinised rotary pump)

For full specifications, please see our website

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