

PlasmaPro® 100

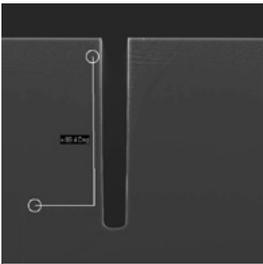


Etch and Deposition Plasma Processing Solutions

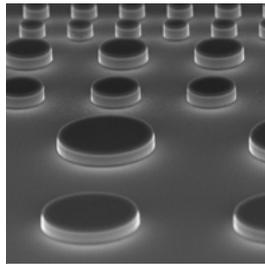
Extensive process library

Our extensive process library supports a wide range of applications for etch and deposition. Our processes are backed by guarantees to ensure rapid start-up during installation.

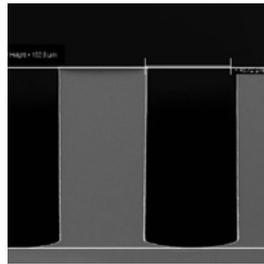
The **PlasmaPro® 100** range of etch and deposition tools can be fitted with a variety of substrate electrodes, enabling processes over a wide temperature range.



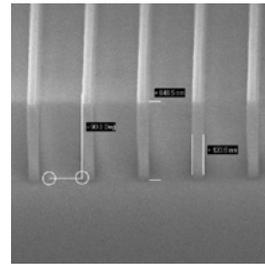
Ultra high selectivity cryo-silicon etch.



GaAs/AlGaAs multilayer etch.



Deep Silicon Bosch etch.

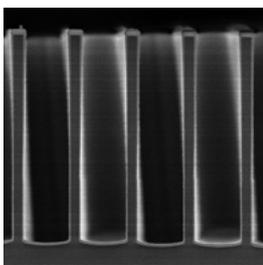
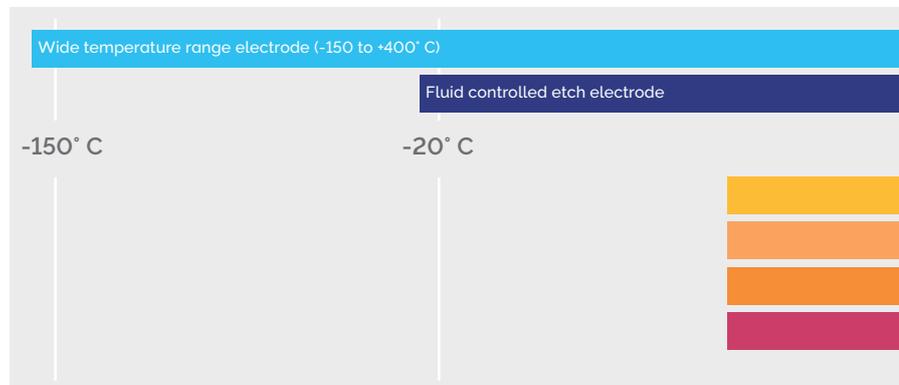


High aspect ratio high quality nanoscale SiO₂ etch.

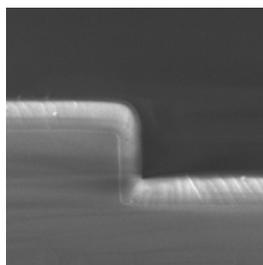
Etching

Two electrodes are available for etching:

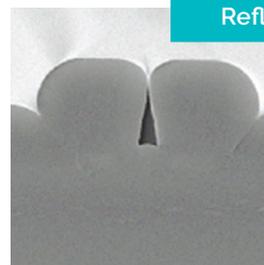
- A wide temperature range electrode (-150° C to +400° C) which can be cooled by liquid nitrogen, a fluid re-circulating chiller or resistively heated. An optional blow out and fluid exchange unit can automate the process of switching modes
- A fluid controlled electrode fed by a re-circulating chiller unit



ICP CVD TEOS SiO₂ at < 100° C.

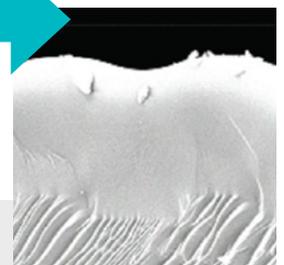


Low stress SiN film (400 nm).



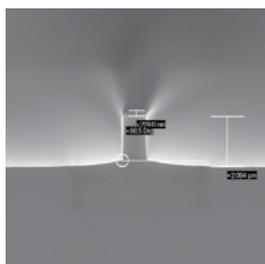
High rate SiO₂ PECVD.

Reflow

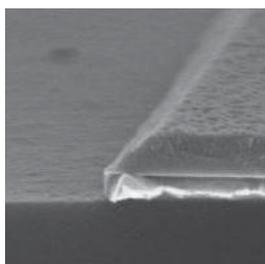


Wide temperature range

Nanoscale & advanced etch	Deposition
Deep RIE of Silicon	Dielectric materials
Compound semiconductor	Metal Nitrides
Metals	Metal Oxides
Oxides	DLC
Organic materials	



Un-clamped InP etching (Cl₂/Ar/N₂).

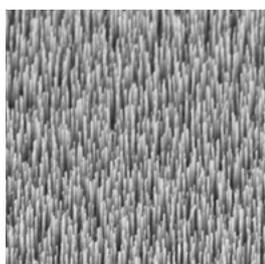
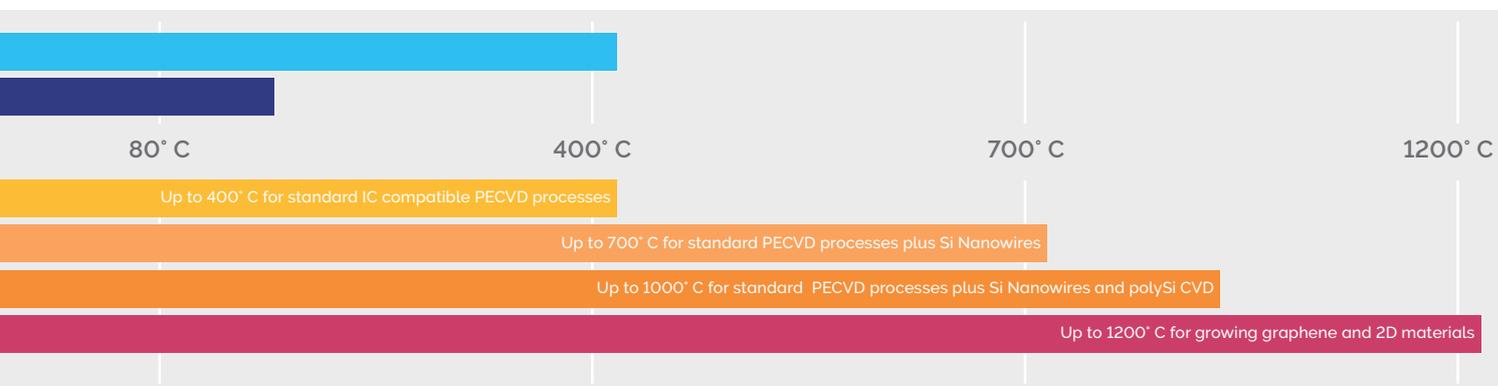


Redeposition-free hot chemical gold etch.

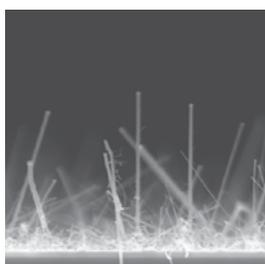
Deposition

Two electrodes are available for deposition:

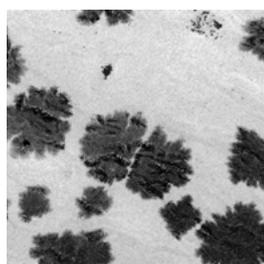
- The ICP CVD tool electrode gives high quality films from room temperature to 400° C
- PECVD tools can be fitted with resistive heated electrodes with capability up to 400° C, 700° C, 800° C, or 1200° C



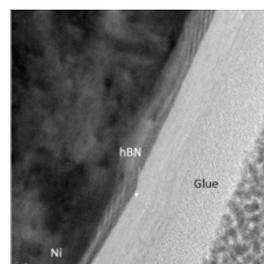
Aligned ZnO nanorods. Courtesy Uni Cambridge.



Si nanowires using Au NP as catalyst.



Graphene grown on Cu foil substrates.



2D Boron Nitride.

Flexible process modules for plasma etch & deposition

Oxford Instruments' **PlasmaPro® 100** process modules offer a 200 mm platform with single wafer and multi-wafer batch capability. The process modules offer excellent uniformity, high throughput and high precision processes.

Our systems are well proven, with processes that are guaranteed to ensure rapid start-up during installation. The **PlasmaPro® 100** range supports a number of markets including but not limited to; MEMS & Sensors, Optoelectronics, Discrete Devices and Nanotechnology. It is flexible enough to be used in research and development, with the build quality to satisfy production needs.

Cassette or single wafer loading options.



PlasmaPro® 100 platforms may be clustered to combine technologies and processes with either cassette or single wafer loading options

- Compatible with all wafer sizes up to 200 mm
- Rapid change between wafer sizes
- Global customer support network
- Low cost of ownership and ease of serviceability
- Compact footprint, flexible layout
- CE marked, safety compliant to EN 13849-1

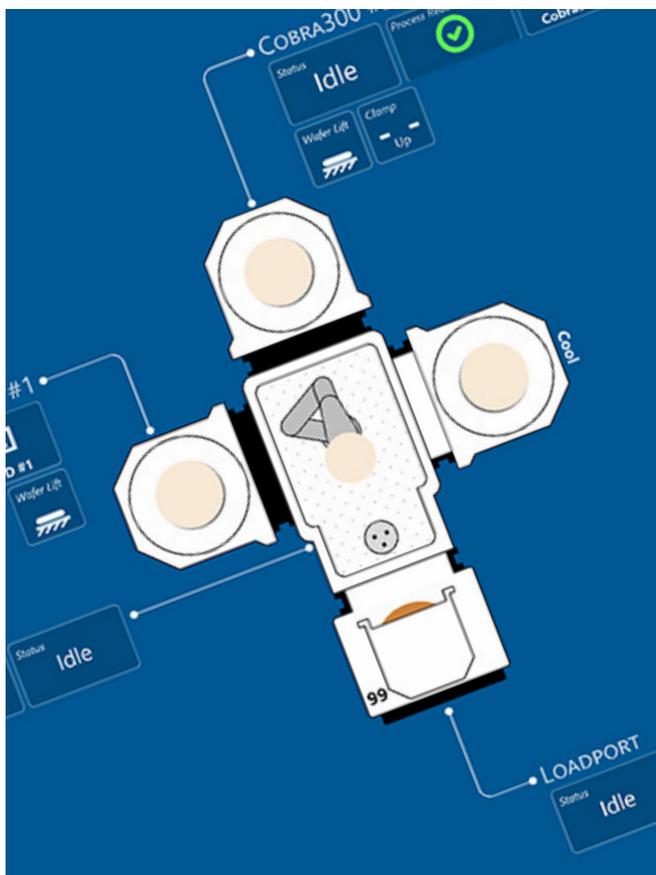


Process Tool Software: PTIQ

PTIQ is the latest intelligent software solution for **PlasmaPro**[®] processing equipment. It provides an exceptional level of system control, optimising process performance.

PTIQ is the latest intelligent software solution for Plasma Technology systems. It provides an exceptional level of system control with powerful scheduling and insightful reporting tools, that unlock new possibilities for improved processing efficiency and dynamic workflows.

PTIQ Software optimises system and process performance in the Lab and Fab, with different levels of software available to suit facility requirements.



User-friendly Design

- 'At a glance' design makes information and control more accessible for maximum user productivity
- System components can be represented by LabView-style functional diagrams to better understand the system architecture
- High contrast colour scheme designed for use in typical yellow light manufacturing environments

Operational Readiness & Accuracy

- Visual indicators of system process readiness help the user avoid operational issues earlier, for better process results
- Enables overlapped chamber operation with wafer transfers (including wafer lift, electrostatic clamping, wafer preheating), for increased throughput
- Compare results of recipe runs to ensure reliable, repeated processes over time, before/after events
- Millisecond accuracy and 1000-point logging for improved data interrogation

Flexibility & Reliability

- Compliance to the SEMI 95 human interface standard provides a familiar experience for your operators and engineers
- Customisable for error-free, multi-user operation in any cleanroom environment

Inductively Coupled Plasma Etching (ICP)

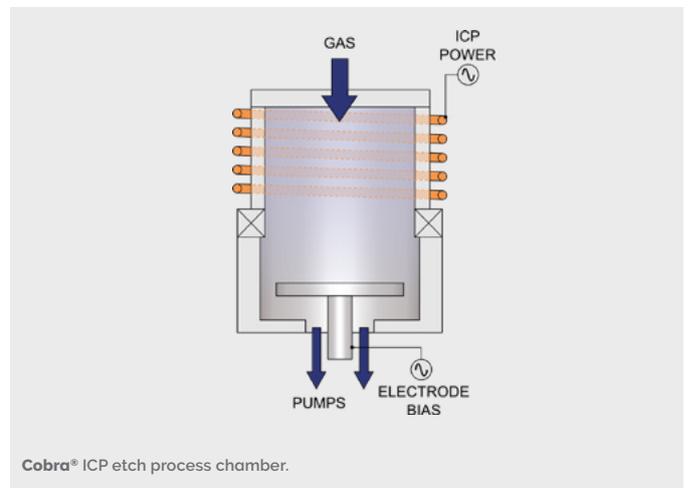
The **Cobra**[®] ICP etch source produces high density reactive ion species at low pressure.

Cobra[®] ICP etch features:

- Delivers reactive species to the substrate, with a uniform high conductance path through the chamber, allowing a high gas flow to be used while maintaining low pressure
- Electrodes available for temperatures from -150° C to +400° C with helium backside cooling and a range mechanical clamp designs
- Optimised hardware and control to deliver processes requiring fast process step switching, e.g. Bosch
- 65 mm and 300 mm etch sources available to suit wafer size and radical to ion ratio to suit process requirements

Options:

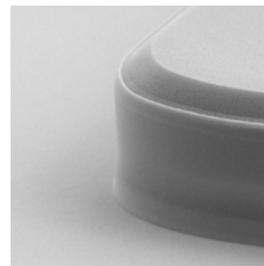
- Electrostatic shielding delivers reduced capacitive coupling resulting in low damage at the wafer
- Chamber wall heating and liners reduce cleaning requirements and increase uptime
- Active spacer on **Cobra**[®] source controls ion uniformity at the wafer



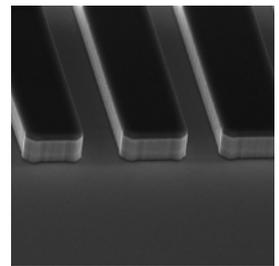
Cobra[®] ICP etch process chamber.



VCSEL Mesa Etch.



GaN Etch with smooth surface.



InP laser facet etch.

Reactive Ion Etching (RIE)

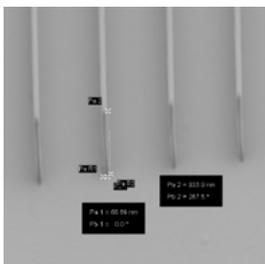
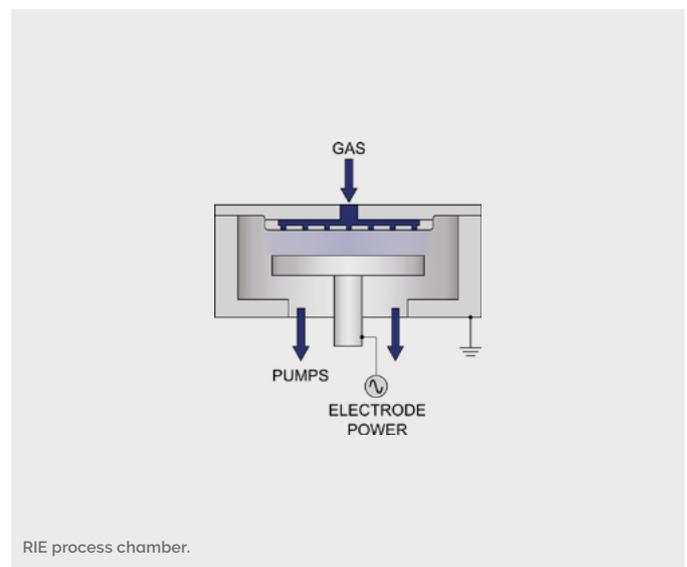
RIE is a simple and economical solution for general plasma etching. Common applications are mask etching and Failure Analysis.

RIE features:

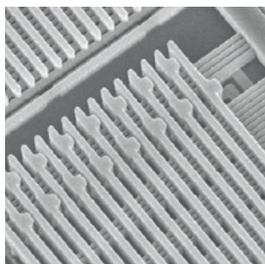
- Solid state RF generators and close coupled matching network for fast and consistent etching
- Full area process gas inlet showerhead for uniform gas distribution
- Electrodes for temperatures from -150°C to $+400^{\circ}\text{C}$
- High pumping capacity gives wide process pressure window
- Wafer clamping with He backside cooling is available for optimum wafer temperature control

Options:

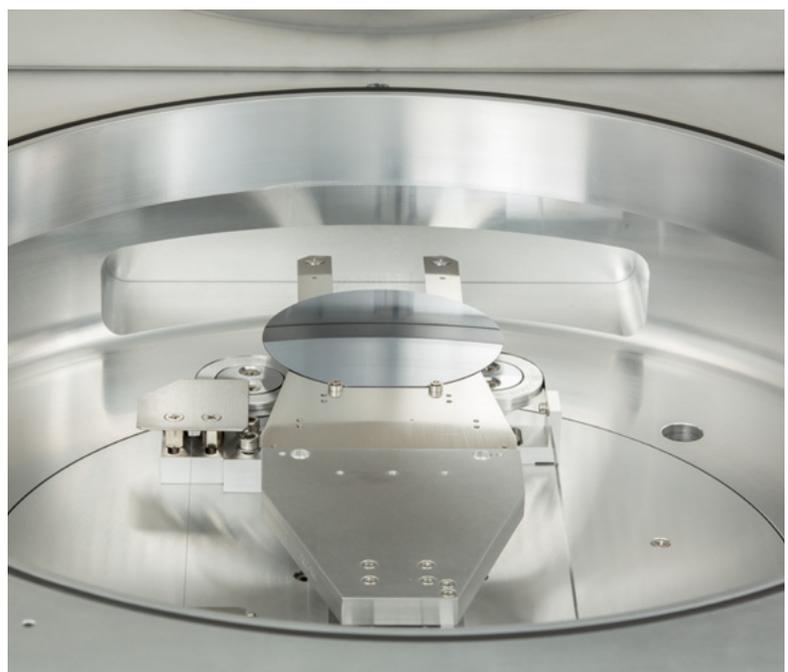
- Chamber wall heating and liners reduce cleaning requirements and increase uptime



70 nm Fused Silica lines.
933nm deep Cr mask.
Courtesy of Cornell
Nanoscience facility.



Dielectric and metal etch –
Failure analysis. Courtesy of
Atmel.



Inductively Coupled Plasma Chemical Vapour Deposition (ICP CVD)

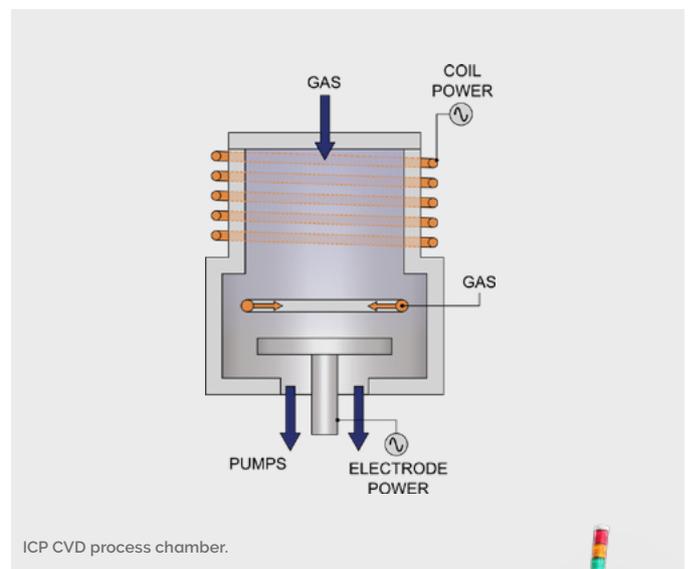
The ICP CVD process module is designed to produce high quality films with high density plasmas at low deposition pressures and temperatures.

ICP CVD features:

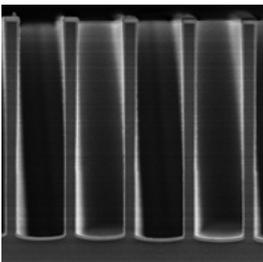
- High quality film deposition with low damage and low deposition temperatures.
- Excellent quality low damage films at reduced temperatures. Typical materials deposited include SiO_2 , Si_3N_4 and SiON , Si and SiC at substrate temperatures as low as 20°C
- ICP source sizes of 300 mm delivering process uniformity up to 200 mm wafers
- Electrodes available for temperature ranges from -150°C to 400°C
- Patented ICP CVD gas distribution technology
- In situ chamber cleaning with end-pointing

Options:

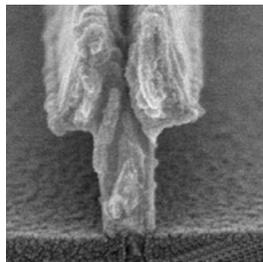
- Wall heating reduces chamber wall deposition
- Helium backside cooling with mechanical clamping ensures uniform wafer temperatures & optimised film properties



ICP CVD process chamber.



SiO_2 deposited using TEOS and O_2 by ICP CVD in $-50\ \mu\text{m}$ deep trench 4:1 aspect ratio.



SiNx deposited by ICP CVD at room temperature for 22 nm T-gate HEMT.

Plasma Enhanced Chemical Vapour Deposition (PECVD)

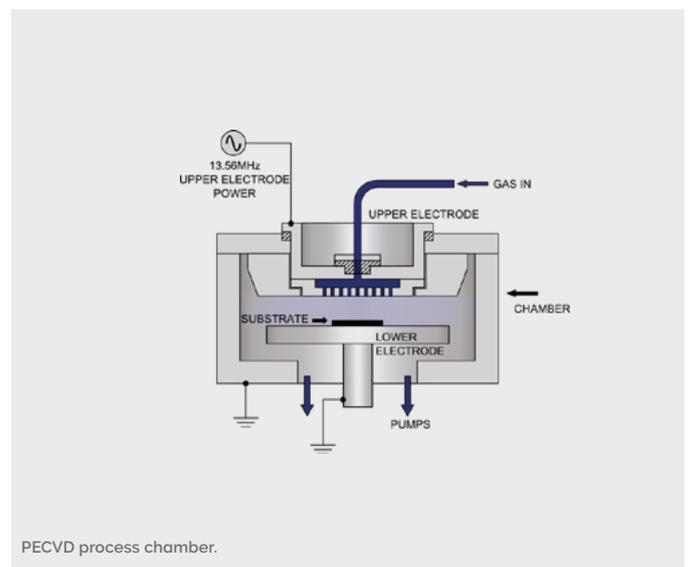
The PECVD process modules are specifically designed to produce excellent uniformity and high rate films, with control of film properties such as refractive index, stress, electrical characteristics and wet chemical etch rate.

PECVD features:

- In-situ chamber cleaning and end-pointing
- Electrically grounded lower electrodes available:
 - 400° C electrode - typical processes are SiO_2 , Si_3N_4 and SiON , amorphous Si and SiC
 - 700° C electrode - in addition to processes above, the electrode enables Si Nanowires, high temperature PECVD films with a wide variety of chemistries
- An optimised upper electrode design, operating in high pressure, high RF power, high flow regimes, enables SiO_2 , Si_3N_4 SiON and amorphous Si deposition at increased rates whilst maintaining excellent film properties and uniformity across the wafer
- RF powered showerhead with optimised gas delivery, provides uniform plasma processing with LF/RF switching allowing precise control of film stress

Options:

- Flexible liquid source delivery module with capacity for up to 3 precursors delivered by:
 - Vapour pressure regulated by heated vapour mass flow controller
 - or Bubbled using argon
- The module is capable of delivering a wide range of precursors including:
 - TEOS, TMA, TMB, TMP, ...



PECVD process chamber.



Process Control Options

Versatile solutions in etch and deposition

Laser interferometry

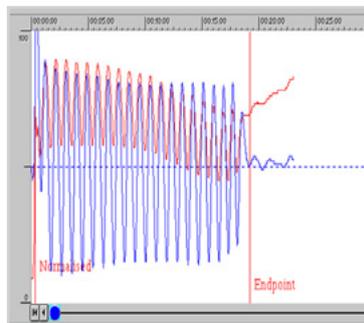
- Allows 'etch-to-depth' within a layer
- Precise etch depth control within multi-layer structures
- Allows end pointing on small samples or those that do not provide a strong OES endpoint



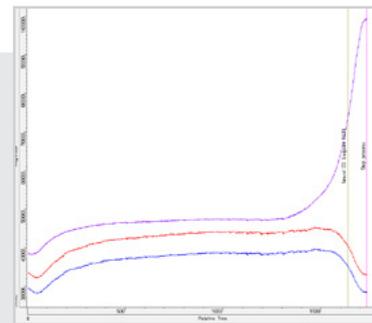
Image allows positioning of laser spot.

Optical emission spectroscopy (OES)

- Allows a precise stop on a particular layer, improving throughput and yield
- Ideal for full wafer or batch end pointing
- Enables monitoring of chamber condition and process 'health'
- Recommended for end pointing of PECVD chamber cleans



Example OES endpoint traces.



Gas Control System

A modular upgrade path for gas lines enables users to maximise flexibility of the **PlasmaPro® 100**. The remote gas line by-pass facility allows broad functionality & ease of use.

- The design enables the easy addition of further gas lines, up to a maximum of 12
- Heated lines with temperature control
- The gas pod may be sited remotely in a service area or mounted on the process module frame. It is vented and ready for ducting into an extraction system for full safety compliance



Serviceability

Layout options

Highly configurable, flexible systems

The external power box can be situated remotely in the cleanroom offering positional flexibility as well as ease of access.

Excellent serviceability & low cost of ownership

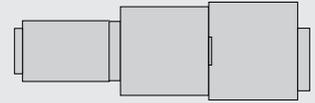
The flexible configuration provides ease of access to all aspects of the tool ensuring excellent serviceability and low cost of ownership.

Superior environmental efficiency

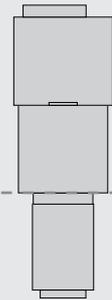
PlasmaPro® 100 has a low heat load and high energy efficiency. The tool has efficient ergonomics and cluster capability, making this a tool of choice for production users.



Ballroom.

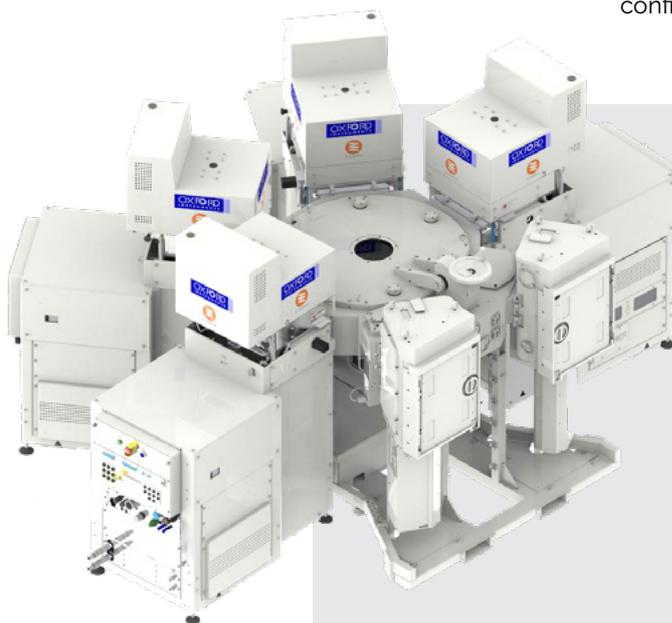


Through the wall.



Cluster Options

PlasmaPro® 100 platforms may be clustered to combine technologies and processes with either cassette or single wafer loading options. Hexagonal or square transfer chamber configurations are available.



6-way hex handler.



4-way square handler.

Worldwide Service

For further information please contact your local Oxford Instruments Plasma Technology office.

Oxford Instruments is committed to supporting our customers' success. We recognise that this requires world class products complemented by world class support. Our global service force is backed by regional offices, offering rapid support wherever you are in the world.

We can provide:

- Flexible service agreements to meet your needs
- Tailored system training courses
- System upgrades and refurbishments
- Immediate access to genuine spare parts and accessories



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