



- Plasma Etch & Deposition
- Atomic Layer Deposition
- Molecular Beam Epitaxy
- Ion Beam Etch & Deposition
- Nanoscale Growth System
- HVPE Tools & Substrates

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Worldwide Service and Support

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:

- Tailored service agreements to meet your needs
- Comprehensive range of structured training courses
- Immediate access to genuine spare parts and accessories
- System upgrades and refurbishments

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System100 Range

Modular tools for wafer processing



The Business of Science®



Plasmalab[®]System100 & Plasmalab[®]System133

Oxford Instruments' **Plasmalab**System100 and **Plasmalab**System133 process modules are built on 200mm and 300mm platforms respectively, with multi-wafer batch capability. The process modules offer excellent uniformity and high throughput processes on a range of applications.

- Processes are guaranteed to ensure rapid start-up during installation
- Oxford Instruments' tools are well proven with over 90% uptime and an installed base of more than 1000 systems
- **Plasmalab**System100 & **Plasmalab**System133 platforms may be clustered to combine technologies and processes
- Exclusive library with over 6,000 process recipes
- Low cost of ownership
- Global customer support network



Process Modules

- ICP** High Density Plasma for high rate etching with low damage
- PECVD** Designed to produce high uniformity dielectric films
- RIE** Proven dry etching used throughout the industry
- ICP-CVD** Produces high density dielectric films at low temperatures
- ALD** Versatile product family, offering remote plasma atomic layer deposition (ALD) & thermal ALD
- PVD** Magnetron sputtering process tool
- Nanofab** Growth systems for nanowires and nanotubes

ICP Etch Process module

High density plasma for etching on 200mm and 300mm platforms

An inductively coupled plasma (ICP) source produces a high density of reactive species at low pressure. Substrate DC bias is independently controlled by a separate RF generator. This allows control of ion energy, dependent on process requirements.

The ICP module 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.

- Optimised design of the 65mm, 180mm & 380mm sources for wafer sizes from 50mm to 300mm with carriers available for multi-wafer batches
- Optional electrostatic shielding delivers reduced ion damage and reduced capacitive coupling
- Optional chamber wall heating and liners reduce cleaning requirements, thus increasing uptime
- 200mm pumping port for high gas conductance – aiding chamber cleanliness
- Electrodes available for temperatures from -150°C to +400°C – offers single system flexibility
- Optional helium backside cooling, electrostatic chuck or mechanical clamping
- ICP accelerator rate enhancement technology

Nanoscale and Advanced etch processes:

- **Deep Reactive Ion Etch of Silicon** – Bosch and cryogenic etch
- **Compound Semiconductor** – GaAs, GaN, InP, CdHgTe and related materials
- **Metals** – Cu, Al, W, Ti, Cr etc.
- **Oxides** – Sapphire, HfO₂, SiO₂, glasses, TiO₂, Ta₂O₅ etc.

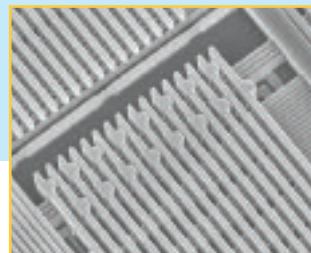
The above are part of our extensive process library which supports a wide range of applications.



Vertical High AR Bosch Si etch – MEMS



Sapphire etch – HBLED's



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



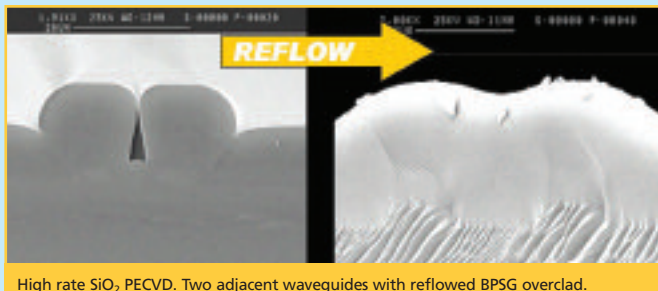
Nanoscale etching by cryo – 50nm lines and spaces – Nanofluidics

Deposition Process Modules

PECVD & Nanofab

The PECVD & Nanofab process modules are specifically designed to produce high uniformity, high rate films, with control of film properties such as refractive index, stress, electrical characteristics and wet chemical etch rate. Typical materials include SiO_2 , Si_3N_4 and SiON , Si and SiC at temperatures between 100°C and 400°C .

- Electrically grounded lower electrode with choice of 400°C or 650°C versions – the high temperature 950°C option is available for specific applications
- RF powered showerhead with optimised gas delivery, provides uniform plasma processing
- Ability to process in high pressure, high flow regimes
- RF switching allows precise control of film stress
- Optional liquid source delivery systems (TEOS)
- In-situ chamber cleaning



High rate SiO_2 PECVD. Two adjacent waveguides with reflowed BPSG overlaid.

ICP CVD

The Plasmalab ICP CVD process module is designed to produce high quality films with high density plasmas at low deposition pressures and temperatures. This results in minimizing film contamination, promoting film stoichiometry, reducing radiation damage by direct ion-surface interaction, and eliminating device degradation at high temperatures. Typical deposited materials include SiO_2 , Si_3N_4 and SiON , Si and SiC at substrate temperatures as low as 20°C .

- 2 sizes of ICP sources, 180mm and 380mm and up to 8" wafer capability with carriers available for multi-wafer needs offer maximum flexibility and cost effectiveness
- Optional wall heating reduces chamber wall deposition
- Electrodes available for temperatures 0°C to 400°C
- Helium backside cooling with mechanical clamping ensures uniform wafer temperatures & optimised film properties
- In situ chamber clean



Low stress SiN film (400nm). Deposition rate 10nm/min, $\text{RI} = 2.01$, Stress = $<100\text{MPa}$. The ICP180 was used for the process.



Process Modules

Extending the versatility of the System100

ALD

FlexAL® 200mm load lock tool – standalone or clustered

Atomic layer deposition (ALD) offers the opportunity to create precisely controlled ultra-thin films for advanced applications on nanometre and sub-nanometre scales. The ALD technique produces pinhole free and conformal coatings into high aspect ratio structures. Remote plasma ALD gives better quality films; enables low temperature deposition and offers process flexibility especially suited for nitride and metal ALD.

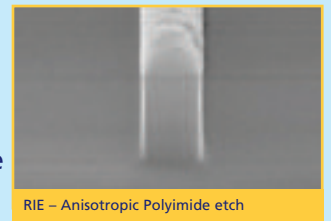
ALD materials and benefits:

- Materials include; Al_2O_3 , TiO_2 , HfO_2 , Ta_2O_5 , ZnO , SiO_2 , La_2O_3 , LaAlO , SiON , AlN , TiN , HfN , TaN , Si_3N_4 , Ru , Pt
- Maximum flexibility with thermal and plasma ALD in one tool
- Ideally suited for research and flexible production with multiple precursor capability
- Designed for safety with precursors housed inside extracted enclosures with attachable glove boxes used during precursor changeover
- In-situ ellipsometry



RIE – Anisotropic dry etching supported by an extensive range of processes

- Solid state RF generators and close coupled matching network ensures fast, consistent plasma match
- 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 helium backside cooling available for optimum wafer temperature control



RIE – Anisotropic Polyimide etch

PVD – Magnetron sputtering process tool

- 4 DC or RF Magnetron Sputter sources allow multiple material deposition
- Up to 8 substrate positions gives high throughput capability
- Substrate RF bias ensures high quality results, particularly step coverage
- 3" to 8" wafer compatibility allows transition from research to production



PVD Al deposition on Si - SiO_2 – the metal layer follows the contour of the etched substrate very well even down into the notches

Versatile Solutions in Etch and Deposition

Range of electrode size and wafer capacity

| Wafer sizes | PlasmalabSystem100 240mm | PlasmalabSystem133 330mm |
|-------------|--------------------------|--------------------------|
| 50mm/2" | 9 | 21 |
| 75mm/3" | 4 | 9 |
| 100mm/4" | 2 | 5 |
| 150mm/6" | 1 | 3 |
| 200mm/8" | 1 | 1 |
| 300mm/12" | – | 1 |

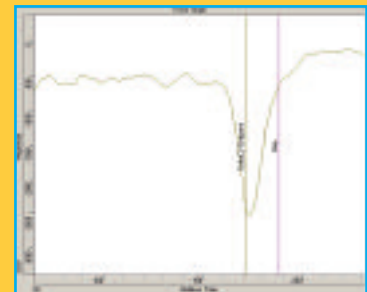
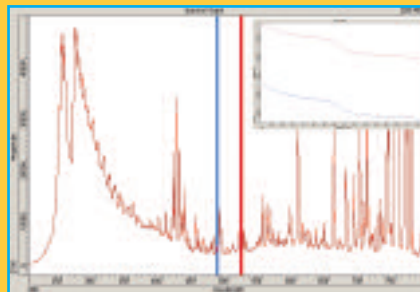
Maximum, actual loading capacity is process-dependent

Multiple Process configurations

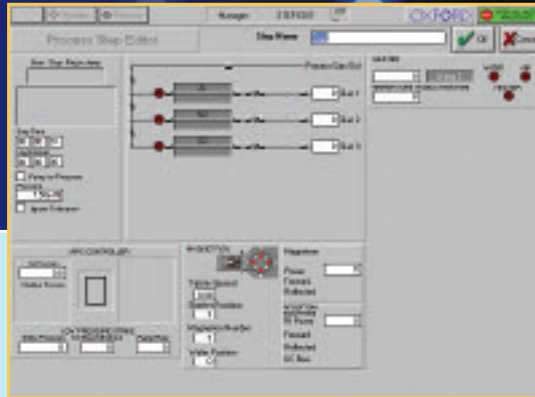
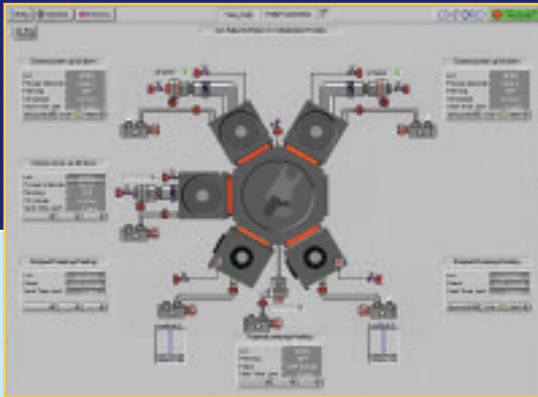
| Technologies | PlasmalabSystem100 240mm | PlasmalabSystem133 330mm |
|--------------|--------------------------|--------------------------|
| PECVD | ✓ | ✓ |
| ICPCVD | ✓ | – |
| ALD | ✓ | – |
| PVD | ✓ | – |
| RIE | ✓ | ✓ |
| ICP Etch | ✓ | ✓ |

Process control

- Laser end-point detection (LEPD) is available for etch depth or deposition thickness monitoring. This is especially useful for etching complex multi-layer structures or small wafer pieces
- Large wafer area and batch process end pointing by optical emission spectrometry (OES)
- OES detects changes in etch by-products or depletion of reactive gas species
- Predictive chamber cleaning and end-pointing
- Integrated with the **PC2000™** process tool software



OES monitoring of a SiO₂ etch endpoint



Process tool software

Oxford Instruments PC2000 Software is renowned for its clarity and ease of use, making it quick to train process operators while retaining full functionality for fab managers and service staff.

- The front end visual interface which controls and monitors the process tool is configured exactly for the customer's system
- Ability to control a tool cluster from a single interface and PC
- Process recipes are written, stored and recalled through the same software, building a library
- Password controlled user login allows different levels of user access and tasks, from 'one-button' run operation to full system functions
- Continuous system data logging ensures traceability of each wafer and process run
- Fully GEM/SECS compatible

Cost of ownership solutions

We work with our customers to create the right system, process, and support package to meet your specific requirements, so our range of Service Level Agreements (SLA) will be tailored to your needs. This can include:

- Guaranteed response times for support engineer visits and technical hotline calls
- Choice of support coverage up to 24/7
- Scheduled preventative maintenance calls
- Managed spares inventory options, including customer dedicated stock, via our parts locations worldwide
- Preferential spare part pricing
- Process training
- Certified maintenance training courses for customer's own engineers in preventative maintenance and first level troubleshooting

Flexible gas line options

- 4-, 8- or 12-line gas pod options enable maximum process flexibility, with easy upgrade from 4 to 8 or 8 to 12 gas lines
- The gas pod may be sited remotely in a service area, and is vented and ready for ducting into an extraction system for full safety compliance

