# Leading edge process tools



Oxford Instruments Plasma Technology provides a powerful range of stand-alone and clusterable high performance process modules, supporting a wide range of applications for etch and deposition.

#### Etching

- Inductively Coupled Plasma Etching (ICP)
- Deep Reactive Ion Etching (DRIE & RIE)
- Reactive Ion Etching/Plasma Etching switchable (RIE/PE)
- Deep Silicon Etching (**DSiE**)
- Reactive Ion Beam Etching (IBE & RIBE)

## Deposition

- Chemical Vapour Deposition (CVD)
- Plasma Enhanced CVD (PECVD)
- Inductively Coupled Plasma CVD (ICP CVD)
- Atomic Layer Deposition (**ALD**) (*PE & thermal*)
- Diamond Like Carbon Deposition (**DLC**)
- Physical Vapour Deposition (PVD)
- Reactive Ion Beam Deposition (RIBD & IBD)

# Plasma Etch

## Cobra<sup>®</sup> (ICP), RIE

Our range of plasma etch tools can be fitted with a variety of substrate electrodes, enabling processes over a wide temperature range.

## PlasmaPro®100 etch tools

Two etch electrodes available:

- Wide temperature range electrode (-150°C to +400°C)
- Fluid controlled electrode fed by a re-circulating chiller unit

2:125 . . .. PlasmaPro 80

Further etch platforms are available with up to 460mm table and large batch capabilities.

## **Cluster options**

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





High aspect ratio high quality nanos SiO, etch

## PlasmaPro 80 etch tool

This compact, small footprint system is easy to site and easy to use, with no compromise on

# Deep Silicon Etch

## Estrelas<sup>®</sup> (DSiE)

Development of our deep silicon etch (DSiE) technology delivers industry leading processes and offers the ultimate in process flexibility.

## PlasmaPro 100 Estrelas tool

- Compatible with 50mm to 200mm substrates
- Mechanical or electrostatic clamping
- Fast-acting close coupled MFCs
- Heated liners
- Improved reproducibility Increased mean time between cleans (MTBC)
- Sub-second Bosch switching times
- Low exposed area (<1%) end point capability





PlasmaPro

100 Estrelas

50nm lines, 500 nm deep nano structure etched using the cryo process







Square handler



Offers versatile etch solutions with convenient open loading.

# Specialist Production Etch

## Polaris<sup>®</sup> (ICP)

## **Oi**Service<sup>®</sup>

## Worldwide Service and Support

Designed specifically for harsh chemistries and capable of etching tough materials such as GaN and SiC along with a huge range of other materials e.g: SiO<sub>2</sub>, Quartz, Si, InP and GaAs.

#### PlasmaPro 100 Polaris tool

- Delivers fast etch rates uniformly on wafers up to 200mm diameter
- Exclusive Electrostatic Clamp technology capable of clamping:
- Sapphire
- GaN on Sapphire
- SiC
- Actively cooled electrode to maintain sample temperature during etch process
- High power ICP source producing high density plasmas
- Magnetic spacer for enhanced ion control and uniformity
- High conductance pumping system
- Reliable hardware and ease of serviceability for excellent uptime



Patterned Sapphire substr for GaN growth



Typical GaN etched feature, Pl remains intac to customer support. Our global network of experienced support professionals delivers the resources, knowledge, and expertise you expect from a world class supplier.

We are committed



#### **Support options**

- Upgrades offer process, productivity & cost reduction benefits
- Support contracts are tailored to customer needs
- Help desk support offers extensive product knowledge
- Training at our facility or yours
- Preventative maintenance
- Remedial site visits
- Spares and repairs through global hubs
- Specialist support

We know our customers have individual needs and can tailor our offering to suit requirements.

## visit www.oxford-instruments.com/plasma

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For worldwide office information please visit our website

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The Business of Science<sup>®</sup>



## Plasma Deposition

# Ion Beam Etch & Deposition

# Nanoscale Growth

## ICP CVD, PECVD, PVD

Our versatile deposition tools cover a wide range of processes and produce high quality films.

#### PlasmaPro 100 deposition tools

ICP CVD and PECVD electrodes are available for deposition over a wide temperature range.





100 PECVD

#### PlasmaPro 80 PECVD tool

Provides high quality PECVD of silicon nitride and silicon dioxide for photonics, dielectric layers, passivation and many other uses.

#### PlasmaPro 400 magnetron sputter tool

A high performance, versatile sputtering tool. It can be configured with many materials for precise thin film deposition. Any substrate

size and shape can be processed up to a maximum of 200mm diameter.



Capable of good lift off and sidewall coverage

PlasmaPro 400

# production.

Low stress SiN film (400nm)

Ion beam etch and deposition offers maximum flexibility coupled with excellent uniformity and is

IBE, RIBE, IBD, CAIBE, RIBD, IBSD, IASD

suitable for a wide range of applications. These attributes, along with the superior process repeatability results and low cost of ownership make the lonfab tool an excellent system that is configurable from R&D to batch

1: 3

#### Key features

- Multiple mode functionality
- Ion beam etching (IBE)
- Reactive ion beam etching (**RIBE**)
- Chemically assisted ion beam etching (CAIBE)
- Reactive ion beam deposition (**RIBD**)
- Ion beam sputter deposition (**IBSD**)
- Ion assisted sputter deposition (**IASD**)
- Capable of clustering with other plasma etch and deposition tools

## **Processes include:**

#### **IBE/RIBE:**

InP/InGaAsP, CMT, SrTiO<sub>2</sub>, LaAlO<sub>2</sub>, MgO, NiFeCo, Au, Pt, TaN







**IBD/RIBD**:

Al, Au, Ti, Mo, SiO<sub>2</sub>, Al<sub>2</sub>O<sub>2</sub>, Si<sub>3</sub>N<sub>4</sub>, VO<sub>2</sub>, SiO, Si





Chemical Vapour Deposition (CVD) techniques form the workhorse for research on nanomaterials. The flexibility of this technique allows deposition down to atomic layers as well as thicker films.

The Nanofab delivers high performance growth of nanomaterials with in-situ catalyst activation and rigorous process control.

#### Nanofab<sup>®</sup> tool

CVD

- Cold wall design with showerhead based uniform precursor delivery
- Remote plasma via ICP optior
- Vacuum load lock for quick sample exchange
- Excellent temperature uniformity
- Optional liquid/solid source delivery system for growth of MoS<sub>2</sub>, MoSe<sub>2</sub> and other TMDCs
- Variable sample sizes up to maximum 200mm wafers





Graphene domains on Copper foil (Growth arrested before filn completion to visualise domains in SEM)



CVD growth of Silicon nanowires using Au nanoparticle catalysts

#### Nanofab® Inside view

precursor pot for liauid/solid precursors. Example: Mo(CO) W(CO), DMDS, DESe. DETe etc.

Dual-beam configuration





# Atomic Layer Deposition

## Remote plasma & thermal ALD

# Oxford Instruments Plasma Technology

## **Systems & Process Solutions for** Etch, Deposition & Growth

Atomic Layer Deposition (ALD) offers precisely controlled ultra-thin films for advanced applications on the nanometre scale, with conformal coating into high aspect ratio structures.

#### FlexAL<sup>®</sup> tool

OpAL

- Remote plasma & therma ALD in one flexible tool
- Automated 200mm load lock for process flexibility
- Clusterable for vacuum transfer of substrates
- Cassette to cassette handling increases throughput



## **OpAL**<sup>®</sup> tool

- Open loaded thermal ALD tool with plasma option
- Field upgrade available for plasma option
- Small wafer pieces up to full 200mm wafers

Thermal and/or plasma chemistries including: **Oxides:** Al<sub>2</sub>O<sub>3</sub>, HfO<sub>2</sub>, SiO<sub>2</sub>, STO, Ta<sub>2</sub>O<sub>5</sub>, TiO<sub>2</sub>, ZnO Nitrides: AIN, HfN, SiN, TaN, TiN Metals: Pt, Ru





(Left) High conformality of plasma ALD SiO<sub>2</sub> (right) Plasma ALD of 80nm Al,O, from TMA and O, plasma in a 10:1 aspect ratio deep trench capacitor structure. Courtesy of Eindhoven University of Technology and NXP

Providing leading edge tools and

processes to key markets worldwide

## **Optoelectronics** Sensors Discrete Devices Nanotechnology



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