Ion beam etch and deposition systems
Oxford Instruments offers a single tool, allowing the flexibility to perform etch and/or deposition and maximising system utilisation.

System specifications can be closely tuned to applications, enabling faster and repeatable process results. The Oxford Instruments Ion Beam range offers functionality in multiple modes:

- Ion Beam Etching (IBE)
- Reactive Ion Beam Etching (RIBE)
- Chemical Assisted Ion Beam Etching (CAIBE)
- Ion Beam Sputter Deposition (IBSD)
- Ion Assisted Sputter Deposition (IASD)

Oxford Instruments' systems are scalable from R&D to batch production in one tool.

**Typical applications and materials**

- IR detectors
- CdHgTe (CMT) etch
- VO$_x$ deposition and etch
- Metal contact and track etch
- Cu, Ni, Al…
- Noble metals: Au, Pt, Pd…
- Diffraction gratings
- SiO$_2$ 'blazed' etch
- Spintronics and MRAM
- AR and HR coatings for laser bars
- Telecom filters
- III-V photonics etching
- Thin film magnetic hard disk heads (TFMH)
- Ring laser gyroscope mirrors

**The Ion Beam Range**

**Ionfab 300Plus**
Etch and deposition processes in one tool

**Optofab 3000**
Purpose made system for optical coatings

**Ionfab 500Plus**
Specialist high precision ion beam deposition system
Ionfab® 300Plus is a modular System designed for ion beam etching and deposition. It is used in a wide variety of processes, particularly in the Semiconductor and Optical Coating Industries.

**Flexibility in a single tool**
- Handles from small pieces, through 100 mm (4 inch), up to 200 mm (8 inch) wafers
- Ability to clamp any shape, and design unique carrier plates
- Wafer handling options
  - Manual loading for one-off trials
  - Load-lock for faster trials
  - Cassette-to-cassette loading/unloading for batch production
- Clusterable with other process tools including Oxford Instruments’ Plasmalab® plasma etch, deposition and sputtering tools, and FlexAL® atomic layer deposition (ALD) tools
- Simple upgrade options to add etch and deposition sources

**Leading ion source and grid set technology**
- Grids are designed to suit specific applications: high uniformity, high rate, & low energy
- Specific deposition grid sets to suit multiple targets, offer superior utilisation of target material

**Easy to site, use and maintain**
- Through-wall interface options allow the system to be sited in “grey area”
- Ease of access to process chamber with two doors
- Ease of maintenance with door-mounted ion sources
- Compact footprint reduces cleanroom space required

Ionfab 300Plus tool images produced with the cooperation of the Optoelectronics Research Centre, University of Southampton, UK.
Specifically developed for high quality optical applications, including High Reflective and Anti Reflective Coatings

**Optofab 3000** is based on the proven architecture of the Ionfab 300Plus – offering the same features and benefits of the Ionfab 300Plus with added capabilities.

- The high speed 8” specimen holder fitted to the system, delivers uniformity of < +/- 1%, and very good layer to layer repeatability. The option to use uniformity shields is available with this system, offering further improvements in layer uniformity.

- A high deposition rate is achievable through the use of the 15cm ion source, with a tailor made dished molybdenum 3 grid design. In addition excellent refractive index results may be achieved with the use of an assist source.

- The option to use a white light optical monitor is available with the **Optofab 3000** patented specimen holder. This is essential in ensuring that each layer is applied at the correct thickness, thereby achieving the specified optical characteristics.
Etch and deposition in one tool via single or dual-beam technology

- A full range of etch source options up to 35cm
- Dual beam configurations (etch plus deposition source) offer the possibility to add capping layer immediately after etch, without exposing the process chamber or wafer to atmosphere
- Increased deposition rates by using etch source as a plasma radical source (IASD)

Deposit different material layers without breaking vacuum

<table>
<thead>
<tr>
<th>Target Size</th>
<th>Target Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>✓</td>
</tr>
<tr>
<td>6&quot;</td>
<td>✓</td>
</tr>
<tr>
<td>8&quot;</td>
<td>✓</td>
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</tbody>
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Vacuum options to suit process

- Turbo-pump fitted as standard
- Cryo-pump option for moisture-sensitive applications
- Additional water vapour cryo trap option
Process control

**Flexibility in a single tool**
- Tilttable substrate holder can be angled from -90° up to +75° (depending upon configuration)
  - Enables ‘blazed’ gratings
  - Allows sidewalls to be cleaned off or etched
- Angle control of substrate relative to deposition target ensures excellent deposition uniformity

**Substrate cooling**
- Prevents degradation of substrate and devices structures/other materials already in place
- Option for wafer backside cooling with He (turbo-pump) or Ar (cryo-pump)

**Process monitoring**
- Etch endpoint monitoring by SIMS for multi-material applications
- Deposition process monitoring
  - Crystal monitor (single or dual head)
  - White Light Optical Monitor (WLOM)
- Chamber gas identification, partial pressure control and leak checking via RGA

**Platen rotation speed**
- Variable platen rotation speed enables deposition rate to be controlled specifically for the application
- Standard and high speed platen options

**Process tool software**
The intuitive, user-friendly PC3000™ graphical interface and control software for the Ionfab 300Plus offers:
- Fast user learning
- Full process recipe editing
- Real-time visibility of process data including SIMS endpointing
- Automatic process and system data logging during runs
- Multi-level password-controlled user access for safe and secure operation

The PC3000 graphical interface showing chamber and load lock status

The process page provides complete control and visibility of the process being run

Screen shot of system including cassette loading & robotic handling
Specialist high-precision ion beam deposition system

**Ionfab 500Plus**

**Designed for ultra high quality optical thin films**

The Ionfab 500Plus was first supplied in 1983 and was the world’s first commercial ion beam sputter deposition system for ring laser gyroscope manufacture. In recent years customers have demonstrated mirrors exhibiting < 20ppm on a commercially available system using the Ionfab 500Plus.

The Ionfab 500Plus has been developed for the requirements of customers demanding high throughput. This is delivered by the use of the 4 x 10” planetary substrates and the ability to use 14” targets.

Another key benefit to customers requiring high throughput is the use of up to 3 targets, meaning that different material layers may be deposited without breaking vacuum.

Low loss mirrors produced by Ion Beam sputter deposition are incorporated in this inertia sensor assembly which incorporates three ring laser gyroscopes. Image courtesy of Marconi Electric Systems

Transmission spectrum of a mirror designed for 633 nm at 45°, deposited in the Ionfab 500Plus, showing:

- Mirror loss < 40 ppm
- Uniformity < ±0.0005
- Surface Roughness < 0.11 nm

Excellent refractive index (RI) control and uniformity provides high wafer yield
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

click onto www.oxford-instruments.com for more information