OXFORD INSTRUMENTS

World Class Ion Beam Etch & Deposition Processing Solutions

Ionfab®

Unique technology serving multiple applications

Ion beam technology provides an exceptionally versatile approach to etch and deposition by offering a single tool and maximising system utilisation.

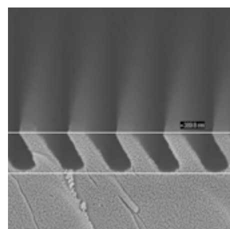
Serves a diverse set of ion beam etch and deposition process requirements across a wide range of applications.

Ion beam etch

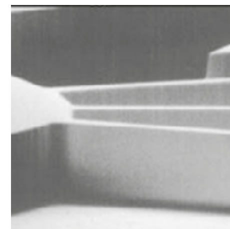
- Slanted etching
- Laser facet etching
- Magnetoresistive random access memory (MRAM)
- Dielectric films
- III-V photonics etching
- Spintronics
- Metal contact and track
- Superconductors

Ion beam deposition

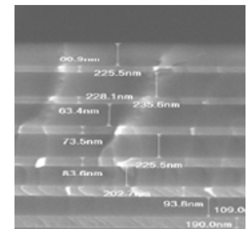
- Laser facet coating including high and anti reflection
- Ring laser gyroscope mirrors
- X-ray optics
- II-VI based Infrared sensors
- Infrared sensors (Vanadium oxide, II-VI)
- Telecom filters



SiO_2 Slanted gratings.



2.5 µm deep anisotropic quartz etch.



Dual layer optical structure Si SiO_2 40 layers stack.

Superior performance in key applications

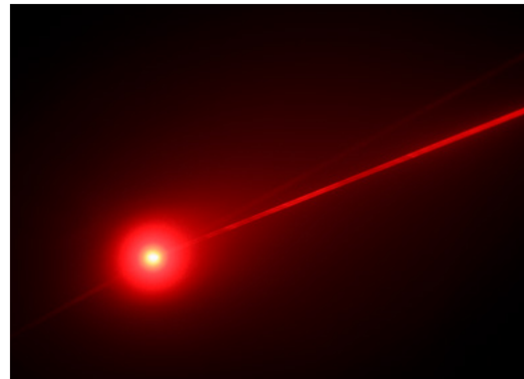
System specifications are closely configured for applications, enabling faster and repeatable process results.

Augmented Reality optical combiners

- Solution for etching Surface Relief Gratings for waveguide combiners on large processing area
- Uniform angle control over 200 mm wafer size
- Patent filed solution to enable high-yield manufacturing

Edge emitting laser

- Laser facet etching with option of angled facet etch for control over laser beam emission angle
- High quality laser facet coating for high power laser



Infrared sensors

- Good resistance repeatibility for VO_x film
- Temperature coefficience of resistance shows no hysterisis

High quality etching

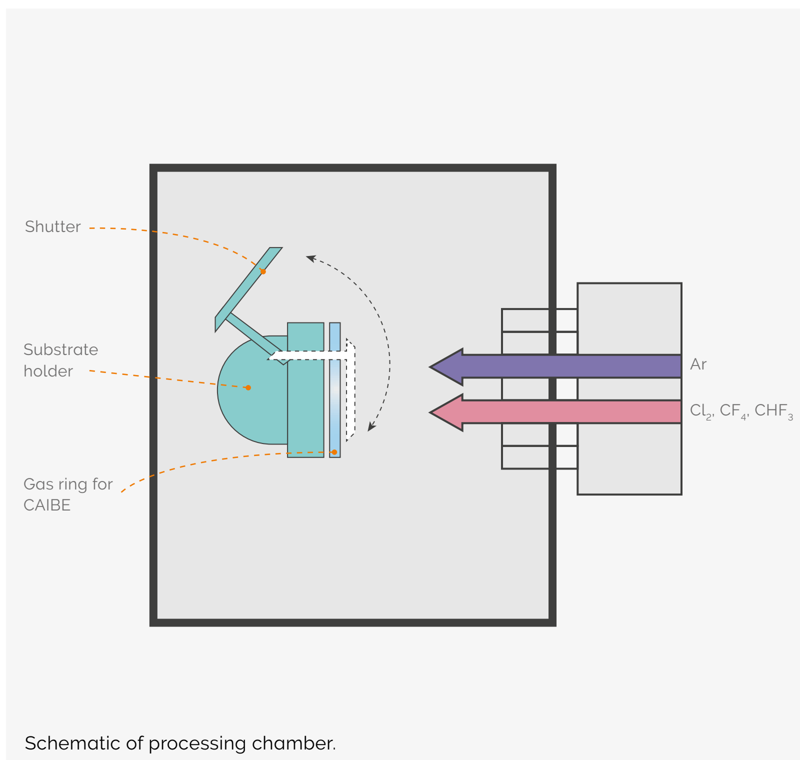
Superior process repeatability and low cost of ownership make the Ionfab tool an excellent system that is configurable from R&D to batch production.

Key benefits

- Flexible configuration for advanced research applications
- Unmatched uniformity and process reproducibility for production
- Flexible wafer handling capability – single wafer load lock or cassette-to-cassette robotic handler

Etching mode

Ion beam etching modes: Ion Beam Etching (IBE), Reactive Ion Beam etching (RIBE), Chemically assisted ion beam etching (CAIBE).



Schematic of processing chamber.

Hardware features

Wafer size	100 mm	200 mm
Etch RF ion source	15 cm	30 cm
Substrate rotation speed	Up to 20 RPM	
Substrate tilt angle	-90˚ horizontal to +65˚ facing down	
Platen temperature	10 ˚C to 300 ˚C chiller or heater configuration	

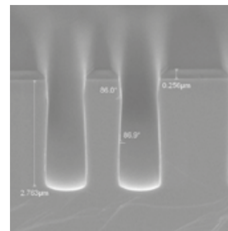
Etch ion sources

- Three-grid assembly designs
- Grid designs tailored for specific etch requirements
- Filamentless DC plasma bridge neutraliser (PBN) for low maintenance

Etching processes and process monitoring

Process library

	Process library
Metal	Au, Ag, Pt, Cu, Al
Magnetics/Alloy	MnIr, CoFe, FeMn, NiCr
Refractory oxides	MgO, SiO_2
III-Vs	InGaAsP, InSb, GaN, GaAs, InP
II-VIs	cDtE, cDhGtE, zNo, zNsE
Composites and others	$SrTiO_3$, $LaAlO_3$, $LiNbO_3$, Si



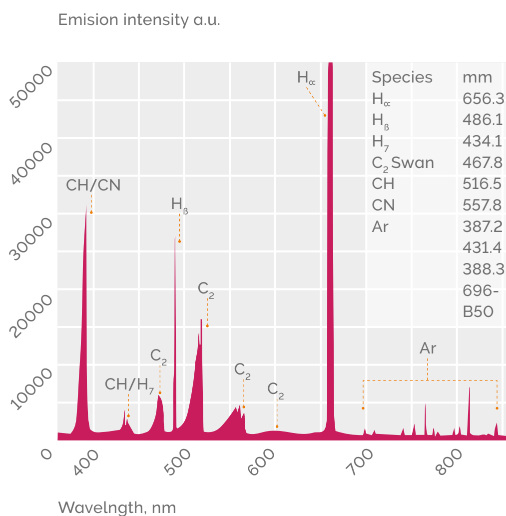
CAIBE GaAs using a hard mask.

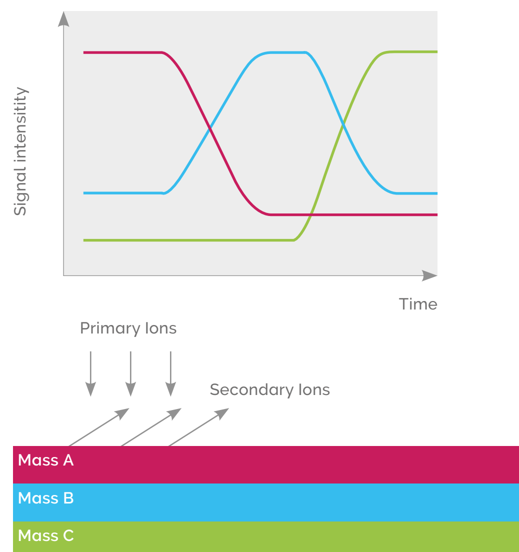
Endpoint technique: OES

Optical Emission Spectroscopy (OES) helps to collect characteristic optical emission spectra from sputtered material that can be then used as an end stop for a particular element/layer being etched.

SIMS

Second Ion Mass Spectroscopy (SIMS) detectors collect secondary ions ejected from each layer of the stack being etched. It enables the process to be stopped on a specific layer from a stack with sub-nanometre thickness.





High quality deposition

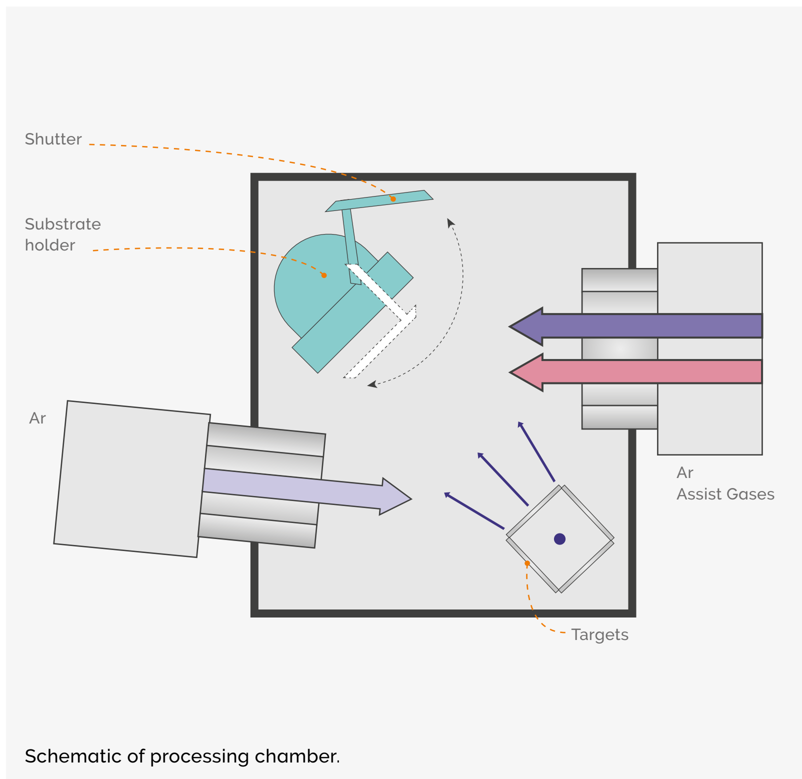
High vacuum operation allows Ion Beam Deposition to deliver thin films with high quality and excellent electrical and optical properties.

Key benefits

- High quality thin films with ultra-low contamination
- High throughput with reduced footprint for lowest cost of operation
- Unmatched batch uniformity and process reproducibility
- Very accurate optical film thickness control
- Very low surface film roughness

Deposition mode

Ion beam sputter deposition (IBSD), Ion assisted sputter deposition (IASD), Reactive ion beam deposition (RIBD).



Schematic of processing chamber.

Hardware features

Wafer size	100 mm	200 mm
Deposition ion source	15 cm	15 cm
Substrate rotation speed	Up to 20 RPM	
Substrate tilt angle	-90˚ horizontal to +65˚ facing down	
Platen temperature	10 ˚C to 300 ˚C chiller or heater configuration	

Deposition key features

- Multiple targets with rotating shutter
- Wide range of sputter target sizes with matching deposition ion source grid designs
- Optional rotating and tiltable high speed substrate holder

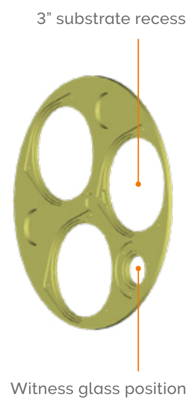
Deposition processes and process monitoring

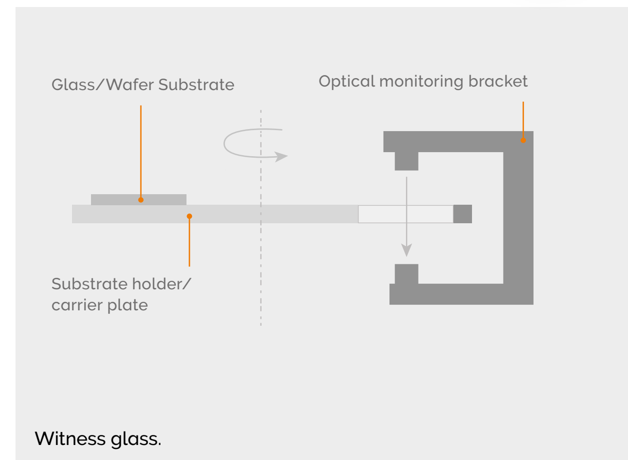
Process library

	Process library
Metal	Au, Ag, Pt, Cu, Al
Other materials	SiO_2, TiO_2, Ta_2O_5, Al_2O_3, HfO_2 ZrO_2, Nb_2O_5, VOx, DLC

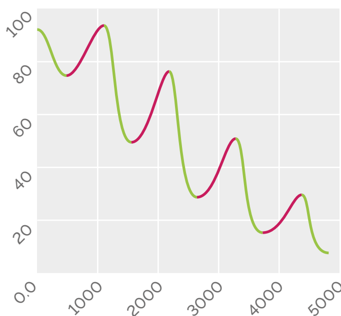
White light optical monitor hardware

Typical carrier plates are designed with an integral witness glass. The white light optical monitor uses the witness glass to monitor the deposition. The "endpoint" is controlled by the transmission signal.



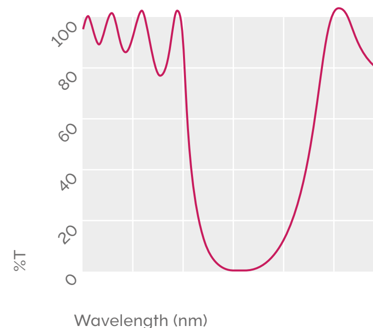


Witness glass.



Transmission spectrum of a 9-layer high-reflecting structure [HL]^4H: H=Ta_2O_5 L=SiO_2.

WLOM in situ optical control transmission signal during deposition of above structure.



Low-loss multilayer reflector for laser diode facet coating.

Delivering Maximum Performance

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