ION BEAM

Ionfab®300

Flexible tools for multiple applications

OXFORD INSTRUMENTS

The Business of Science®

Ionfab300

Unique abilities in etch and deposition

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

Our systems have flexible hardware options including open load, single substrate load lock and cassette to cassette. System specifications are closely tuned to applications, enabling faster and repeatable process results.

Key Features

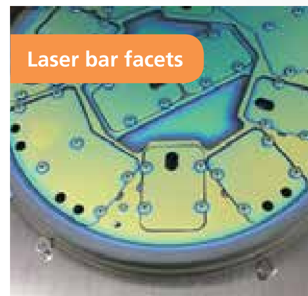
- Multiple mode functionality:
  - Ion beam etching (IBE)
  - Reactive ion beam etching (RIBE)
  - Chemically assisted ion beam etching (CAIBE)
  - Reactive ion beam deposition (RIBD)
  - Ion beam sputter deposition (IBSD)
  - Ion assisted sputter deposition (IASD)
- Capable of clustering with other plasma etch and deposition tools
- Single wafer loadlock or cluster wafer handling
- Dual-beam configuration

Extensive and diverse applications

Ion Beam Etch	Ion Beam Deposition

• Magnetoresistive random access memory (MRAM)
• Dielectric films
• III-V photonics etching
• Spintronics
• Metal contact and track
• Superconductors
	• Laser facet coating
	  – High reflection (HR)
	  – Anti-reflection (AR)
	• Ring laser gyroscope mirrors
	• X-ray optics
	• Infrared (IR) sensors
	  – II-VI -based
	• Telecom filters

The **Ionfab**300 platform serves a diverse set of ion beam etch and deposition process requirements across a wide range of applications.



Ionfab300

Versatile system for multiple applications

The **Ionfab**300 is available in standard or large chamber, tailored for both etch and deposition applications.

Ionfab300 Standard Chamber (SC)

A compact ion beam etch and deposition system designed for flexible research and pilot production, equipped with up to two (15cm) ion sources for etch or deposition. This makes it ideal for deposition on up to 200mm wafer size and with etch process optimised for up to 100mm wafer size.

Ionfab300 SC

Ionfab300 Large Chamber (LC)

Having essentially the same footprint but with a larger process chamber, it is designed to process wafers up to 200mm for both etch and deposition. Equipped with a 30cm etch ion source, the system provides excellent etch uniformity and superior process stability, making it a great choice for pilot and full scale production.

Material Types	Examples
Metals	Au, Ag, Pt, Ni, Cu, Al, etc.
Magnetics / Alloy	MnIr, CoFe, FeMn, NiCr, FeNiCo, etc.
Multi-layers	SiO_2, TiO_2, Ta_2O_3, Al_2O_3, etc.
Refractory oxides	MgO, SiO_2, Al_2O_3, HfO_2, ZrO_2, Nb_2O_5, etc.
III-Vs	GaN, GaAs, InP, InGaAsP, InSb, etc.
II-VIs	CdTe, CdHgTe, ZnO, ZnS.
Composites and others	VOx, DLC, $SrTiO_3$, $LaAlO_3$, $LiNbO_3$, etc.

Ionfab300 LC

Scalable from R&D to production in one tool

*The **Ionfab**300 is capable of clustering with other plasma etch and deposition tools*

IBE

Ion Beam Etch

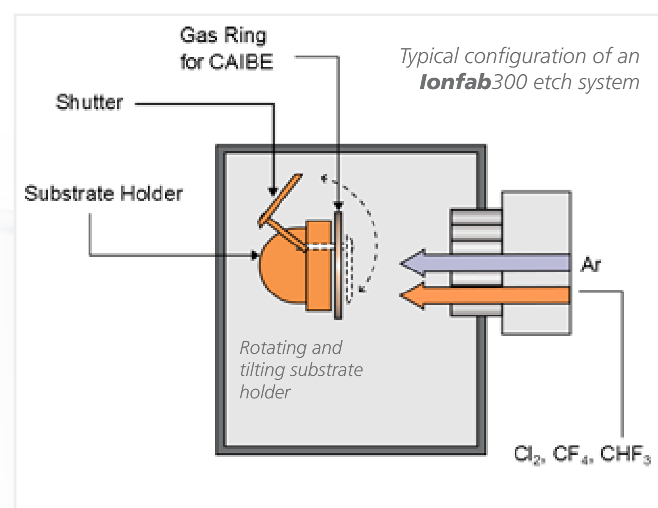
IBE, RIBE and CAIBE

Ion beam etch offers maximum flexibility coupled with excellent uniformity and is suitable for a wide range of applications.

These attributes, along with the superior process repeatability results and low cost of ownership make the Ionfab tool an excellent system that is configurable from R&D to batch production.

Ion Beam Etching Modes

- Ion beam etching (IBE)
- Reactive ion beam etching (RIBE)
- Chemically assisted ion beam etching (CAIBE)



*Typical configuration of an **Ionfab**300 etch system*

Key Benefits

- Flexible configuration for advanced research applications
- Unmatched uniformity and process reproducibility for production
- Flexible wafer handling capability – open load, single wafer load lock or cassette-to-cassette robotic handler
- Accurate end point detection – SIMS, optical emission
- Two substrate holder options:
  - 0 – 20 RPM, 0 – 300°C water cooled
  - 0 – 1000 RPM, quartz lamp heating with WLOM option

Hardware features	Standard Chamber	Large Chamber
Etch RF ion source	15cm	30cm
Etch area	100mm	200mm
Substrate rotation speed	Up to 20 RPM	
Substrate tilt angle	-90° horizontal to +65° facing down	
Platen temperature	5°C to 300°C	
End point detection	• Secondary ion mass spectroscopy (SIMS) • Optical emission spectroscopy (OES)	

Etch Ion Sources

- 15cm or 30cm RF inductively coupled plasma ion source
- Three grid assembly designs
- Grid designs tailored for specific etch requirements
- Filamentless DC plasma bridge neutraliser (PBN) for low maintenance

IBD

Ion Beam Deposition

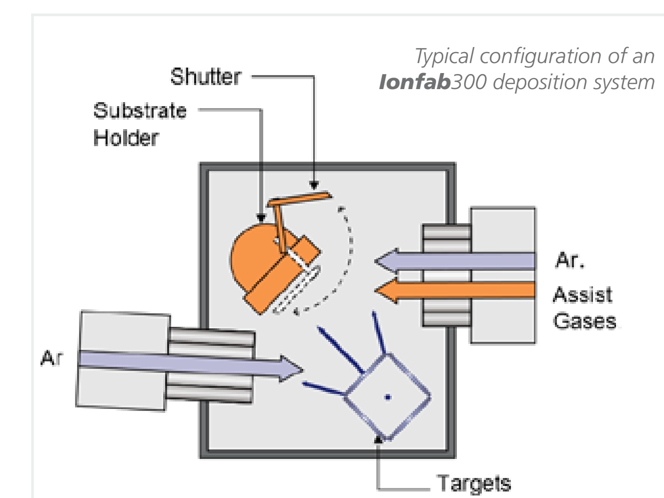
IBSD, IASD & RIBD

Our ion beam deposition products are chosen for their ability to produce deposited films with high quality, dense and smooth surfaces.

The in-house designed ion sources offer the most reliable and stable deposition processes with excellent run to run repeatability that are ideal for production.

Ion Beam Deposition Modes

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

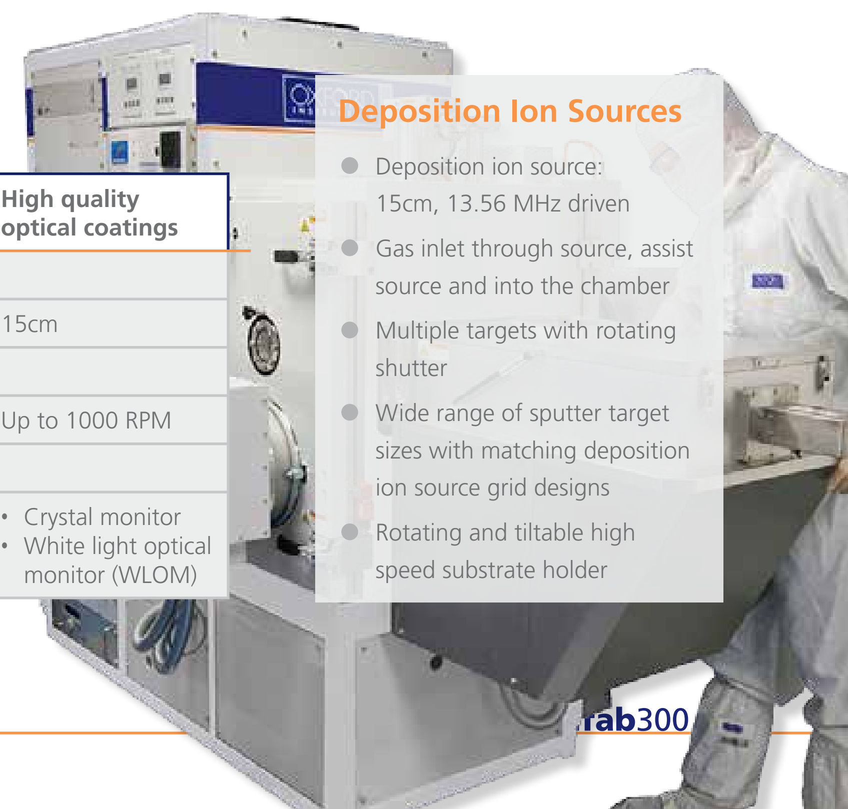


*Typical configuration of an **Ionfab**300 deposition system*

Key Benefits

- High quality thin film with ultra low contamination
- High throughput with reduced footprint for lowest cost of operation
- Unmatched batch uniformity and process reproducibility
- Patented high speed substrate holder (up to 1000 RPM) equipped with a white light optical monitor design for very accurate in-situ optical film control
- Very low surface film roughness

Hardware features:	Standard Chamber	Large Chamber	High quality optical coatings
Deposition ion source	15cm		
Assist or pre-clean source	15cm	30cm	15cm
Deposited area	Up to 200mm		
Substrate rotation speed	Up to 20 RPM		Up to 1000 RPM
Number of targets	Up to 4 targets		
End point detection	Crystal monitor		• Crystal monitor • White light optical monitor (WLOM)

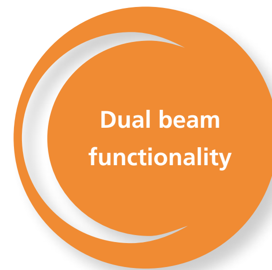


Deposition Ion Sources

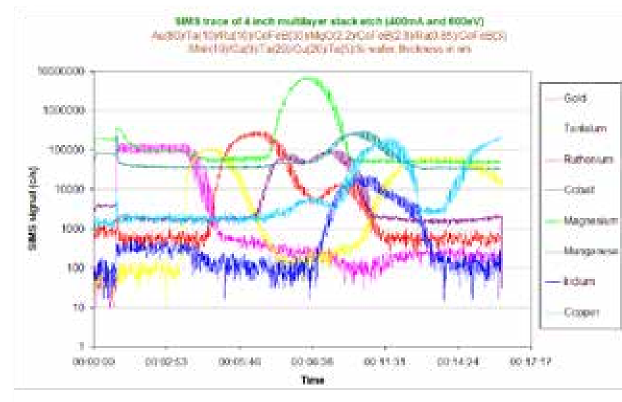
- Deposition ion source: 15cm, 13.56 MHz driven
- Gas inlet through source, assist source and into the chamber
- Multiple targets with rotating shutter
- Wide range of sputter target sizes with matching deposition ion source grid designs
- Rotating and tiltable high speed substrate holder

Etch Process Monitoring

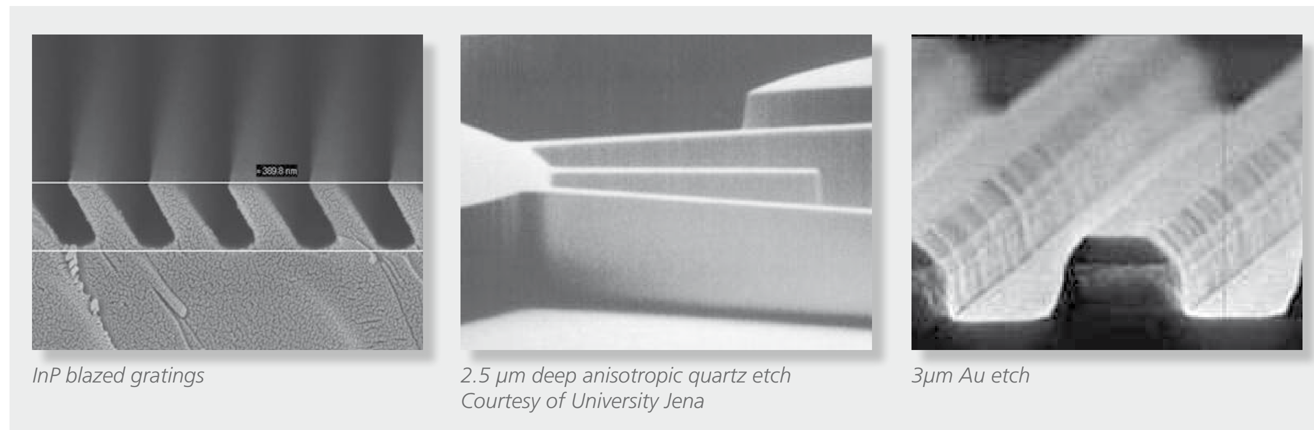
- OES end point detection
- White light optical monitors
- High speed specimen holder
- Etch endpoint monitoring by SIMS for multi-material applications; retractable and isolated from RIBE gases, e.g. Cl_2
- Dual beam functionality for flexible and demanding process requirements
- Closed-loop control of partial pressure of process gas using high pressure RGA for enhanced control of film properties and stoichiometry



***Ionfab**300 with Hiden SIMS Probe EPD Fitted*



SIMS mass spectrum. Courtesy of Kiel University



InP blazed gratings

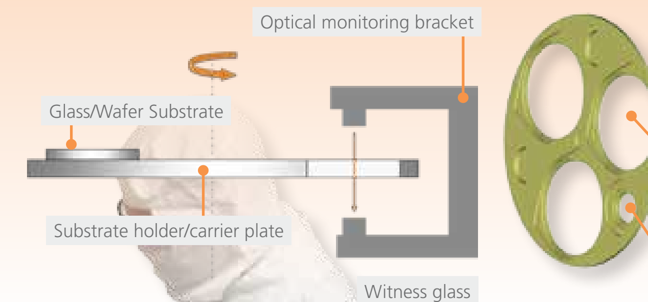
2.5 µm deep anisotropic quartz etch Courtesy of University Jena

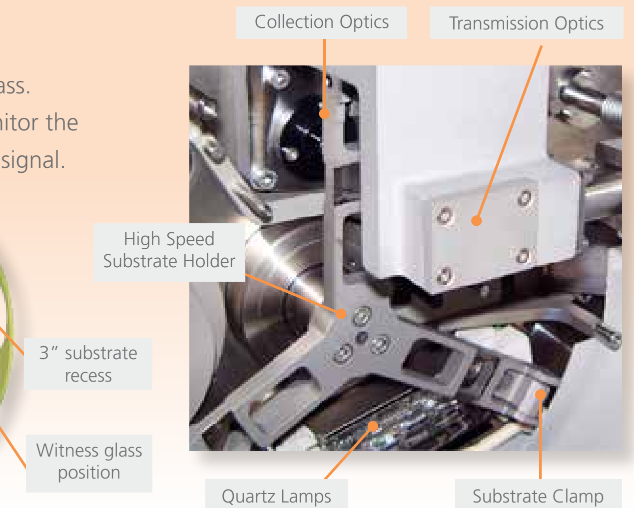
3µm Au etch

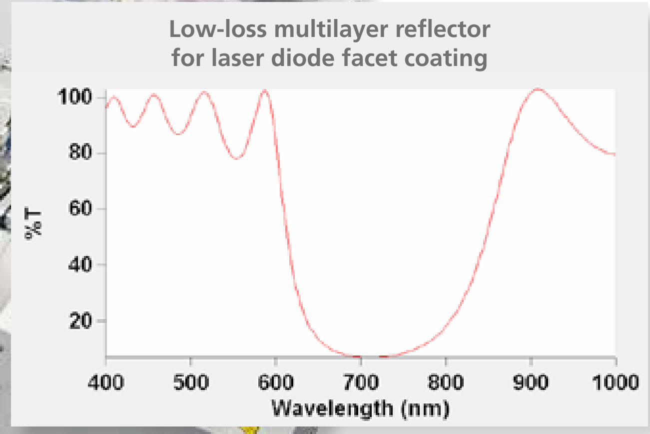
Deposition Process Monitoring

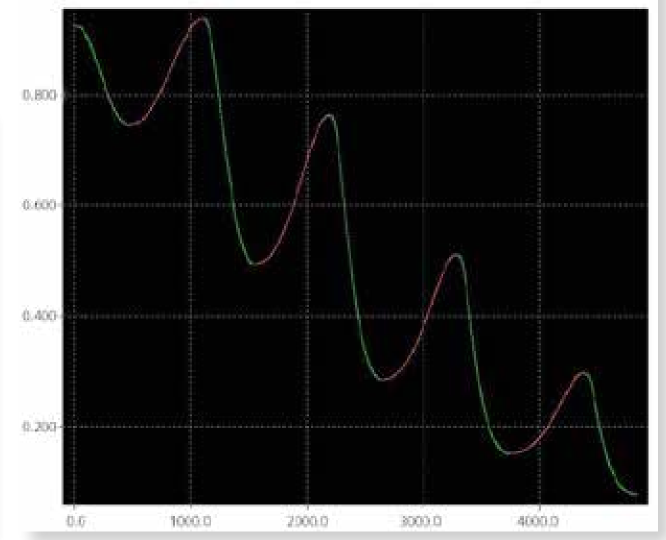
White Light Optical Monitor Hardware

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.









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

ION BEAM

Ionfab300

Technical Specifications

Ionfab300 Large Chamber Layout

Layout for standard chamber option is available on request

All measurements in mm

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

Visit **www.oxford-instruments.com** for more information

Oxford Instruments Plasma Technology

For more information please email:
plasma@oxinst.com

UK
Yatton
Tel: +44 (0) 1934 837000

Germany
Wiesbaden
Tel: +49 (0) 6122 937 161

India
Mumbai
Tel: +91 22 4253 5100

Japan
Tokyo
Tel: +81 3 5245 3261

PR China
Beijing
Tel: +86 10 6518 8160/1/2
Shanghai
Tel: +86 21 6132 9688

Singapore
Tel: +65 6337 6848

Taiwan
Tel: +886 3 5788696

US, Canada & Latin America
Concord, MA
TOLL FREE: +1 800 447 4717

www.oxford-instruments.com

This publication is the copyright of Oxford Instruments Nanotechnology Tools Ltd and provides outline information only, which (unless agreed by the company in writing) may not be used, applied or reproduced for any purpose or form part of any order or contract or regarded as the representation relating to the products or services concerned. Oxford Instruments' policy is one of continued improvement. The company reserves the right to alter without notice the specification, design or conditions of supply of any product or service. Oxford Instruments acknowledges all trademarks and registrations © Oxford Instruments plc, 2015. All rights reserved. Ref: OIPT/300/2015/001

OXFORD INSTRUMENTS

The Business of Science®