

ProcessNews

A Newsletter from Oxford Instruments Plasma Technology (OIPT)

■ Plasma Etch & Deposition ■ Atomic Layer Deposition ■ Ion Beam Etch & Deposition ■ Nanoscale Growth Systems ■ HVPE

Welcome to ProcessNews



Since our last print version of **ProcessNews** the economic downturn has deepened and the semiconductor and electronics industries continue to suffer as consumer confidence disappears.

However, despite the downturn, Oxford Instruments Plasma Technology (OIPT) continues to see growth and still remains committed to supporting its key markets as well as developing processes and tools for emerging technologies.

Some of the bright spots include the compound semiconductor market where investment is driving our business as new technology is introduced, particularly in the area of LCD backlighting.

More traditional areas such as power device manufacturing are also buoyant and OIPT have received multiple orders for tools for Diamond Like Carbon (DLC) deposition. We have also recently commissioned a number of multi-chamber cluster tools in Asia with follow on orders expected shortly.

The rapid growth in the production tool area of our business is complemented by our traditional research market, which also remains strong with a recent order for six tools from Lawrence Berkeley National Laboratory (LBNL) in the USA and a ten tool order from a Middle East research centre confirming our position as the leading supplier of etch and deposition tools to the academic market.

In photovoltaic research we have seen our thin film equipment portfolio develop, resulting in a number of significant sales of cluster tools into the solar energy market, including increased interest in Atomic Layer Deposition (ALD), driven by the ground breaking work at TU Eindhoven using our **FlexAL** Plasma Enhanced ALD tool to produce unparalleled levels of surface passivation of crystalline silicon solar cells.

Following last year's acquisition of TDI, our technology teams both in the USA and in the UK have developed our new HVPE reactor – **CrystalFlex**. This HVPE reactor allows a multi wafer growth process not offered elsewhere and can grow thick GaN layers more quickly than MOCVD, increasing throughput and reducing cost.

These innovations and more have been achieved as a result of continuing investment in research, in top quality personnel globally, and responding to our customers' requirements.

However, we recognise that the success of our business relies entirely on you, our customer, and we would like to thank you for your continuing support through these difficult times.

I hope that you find this edition of **ProcessNews** interesting and informative, and if you have any feedback or articles on your work that you would like us to include, we would be more than happy to hear from you. Enjoy your read!

Mark Vosloo
Sales & Customer Support Director OIPT

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Oxford Instruments celebrates 50 years!

This year we celebrate 50 years of continuous scientific innovation and excellence. The quest for new ideas, the thirst for leading-edge technologies and the belief in offering our customers a quality service has been the driving force behind our growth and success.

From its small beginnings as the first commercial spin-out company from Oxford University, Oxford Instruments is now a

worldwide business supplying high technology tools and systems into diverse markets, which include industrial analysis, research, education, space, energy and the life sciences.

Our ability to observe and manipulate matter at the smallest scale allows us to exploit the emerging potential to be found in nanotechnology, addressing the global issues of protecting the environment, conserving energy, security and health.



The Business of Science

ALD Al₂O₃ for Passivation of Crystalline Silicon Solar Cells

Knut Beekmann, Product Manager, OIPT

In the battle to improve efficiency in crystalline silicon (c-Si) solar cells, one of the critical factors is avoiding recombination losses of the charge carriers created in the base material.

One of the problems is that sooner or later, these carriers meet a surface or interface and any defects at the surface or interface can increase recombination rates. A good surface passivation is required to achieve very efficient c-Si solar cells. A cost driven reduction in the cell thickness leads to an increase in the relative surface area to volume. This in turn makes a high quality surface passivation a critical factor to improve the efficiency for conventional solar cells.

Typically, the c-Si surface is passivated using a thin film of either silicon dioxide or silicon nitride. Silicon oxide would normally be thermally grown and undergoes additional chemical annealing to provide a very high quality interface. The high temperature required to thermally grow the silicon dioxide however; generally limits its applicability to high quality c-Si material. Silicon nitride, such as that deposited by plasma enhanced chemical vapour deposition as an anti reflection coating, has also gained ground as a commonly used passivation material however; provides inferior passivation to thermally grown silicon dioxide.

Both silicon oxide and silicon nitride have positive fixed charge densities. These contribute to improving the passivation quality through establishing an electric field at and below the silicon surface. This is particularly useful in the case of n-type c-Si, where recombination is reduced by the minority charge carrying holes being shielded from the surface. For p-type c-Si, such positive charge passivation films will have the opposite effect. The electrons will be attracted to the surface, increasing minority carrier concentration and increasing recombination rates.

The critical importance of achieving a high quality surface passivation has opened the field of development to potential new materials. One such material that has been investigated is aluminium oxide and specifically, atomic layer deposition (ALD) of aluminium oxide. Recently, the relative passivation properties of thermally grown ALD films have also been compared with those of plasma assisted ALD layers deposited on a **FlexAL** reactor¹.

Films were analysed post annealing and showed identical stoichiometry and structural properties however; C-V analyses of both types of film have yielded significant differences in the flatband voltage shifts. The plasma assisted film had a much greater negative fixed charge density which in turn can explain significantly higher measured effective lifetimes of the charge carriers of p-type c-Si and a better surface passivation. Similar plasma assisted ALD films have been used in the passivation of highly doped p-type emitters on n-type solar cells yielding a cell efficiency of 23.2%².

References

- 1 Silicon Surface Passivation by Atomic Layer Deposited Al₂O₃ – B. Hoex, J. Schmidt, P. Pohl, M. C. M. van de Sanden and W. M. M. Kessels. *Journal of Applied Physics* 104 044903 (2008)
- 2 High Efficiency n-type Si Cells Based on Al₂O₃ Passivated Boron Emitters – J. Benick, B. Hoex, M. C. M. van de Sanden, W. M. M. Kessels, O. Schulz, and S. W. Glunz. *Applied Physics Letters* 92 253504 (2008)

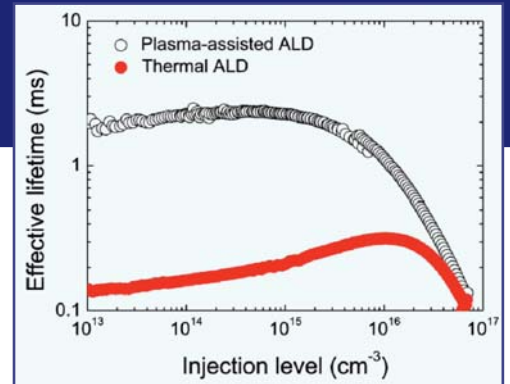


Figure 1: Injection level dependent effective lifetime of a p-type c-Si wafer symmetrically passivated by a 30 nm Al₂O₃ film synthesized by plasma assisted ALD and thermal ALD on the **FlexAL** reactor.

Data courtesy of Eindhoven University of Technology¹

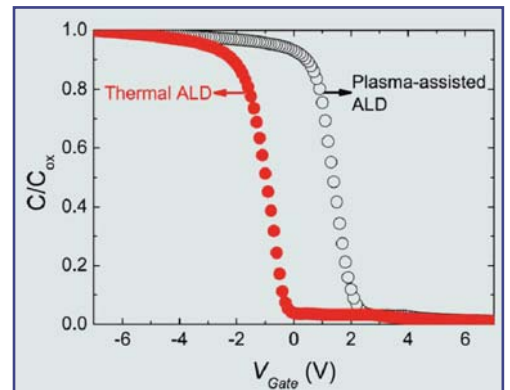


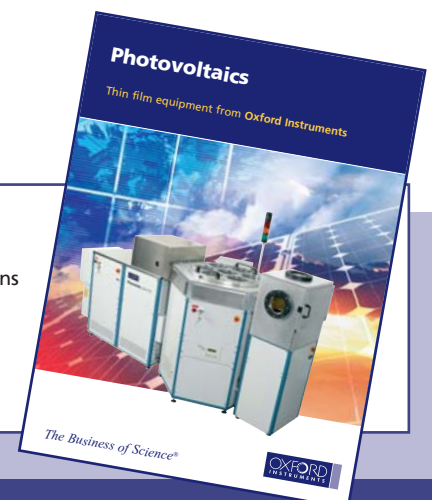
Figure 2: C-V measurements of a MOS structure containing 20nm thick Al₂O₃ films. The Al₂O₃ films were synthesized by thermal and plasma assisted ALD on H-terminated 20-30 Ωcm p-type C-Si wafer and subsequently annealed for 30 min at 425°C in N₂.

Data courtesy of Eindhoven University of Technology¹

New Photovoltaics Brochure now available

Oxford Instruments has over 20 years experience in thin film processing, and great cluster tool solutions for PV applications. Our new Photovoltaics brochure outlines the many system and process options available, including PVD, ALD, CVD and Etch technologies.

Please contact your local Oxford Instruments office to request your copy or email process.news@oxinst.com



What's the wafer temperature 2: The New Batch

Mark Dineen PhD, Principal Applications Engineer, OIPT



Dr Mike Cooke detailed in the Autumn 2008 issue of **ProcessNews**, how a sample experiences heating when it is plasma processed. Mike also explained how 'helium backside cooling' can be used to control the sample temperature.

This is especially important when using a photoresist mask on samples. Photoresist is the easiest material to use to define the complicated patterns that create devices from flat semiconductor wafers. However there is a disadvantage when using photoresist as it has relatively low upper temperature limits (typically 130°C).

When photoresist is used as a mask for plasma processing the vital questions are:

- How hot is the sample getting?
- How can it be controlled?

As you can imagine life gets harder when trying to increase the number of wafers you are trying to cool at one time!

Why etch more than one wafer?

HBLED devices are commonly on 2" wafers and to significantly reduce costs one must process as many of these in one run as possible. If performing Patterned Sapphire Substrate (PSS) processing, photoresist is used as a mask and to achieve a decent etch rate on the sapphire, cooling is required.

The best way to approach this problem is to start with the basics; in this case how hot is the electrode getting? The electrode is actively cooled but if one is relying on the electrode to provide the wafer cooling source, this must stay as cold as possible.

Figure 1 shows the temperature that the electrode surface reaches under high power etch conditions. Without the He cooling, the temperature of the sample placed on the electrode continues to rise over time, eventually reaching over 200°C!

However, the electrode temperature is below 50°C so it is hoped that this can be used to cool the sample during etching.



Figure 2:
12 x 2" Sapphire Wafers ready for etching

The next obstacle to overcome is how to make sure that there is a good measure of He cooling medium behind each wafer for a multiple wafer batch. The solution is to load the wafers in to a carrier which clamps each wafer, and then clamp this carrier in the system. The carrier is specially designed to allow He to flow to the back of every wafer ensuring each one is kept cool.

Figure 2 shows a fully loaded carrier with twelve 2" wafers in situ.

The efficiency of the cooling is shown in Figure 3. The wafer temperature is kept well below 90°C even after one hour of etching. The photoresist integrity is maintained at this temperature.

Keeping samples cool is only part of the story. The samples must now be etched with good uniformity and selectivity to the photoresist, to obtain the best feature possible. Figure 4 shows the etch profile across the wafer with this reproduced across the whole batch of twelve wafers.

Summary

Etching large numbers of wafers with a photoresist mask requires good temperature control of each wafer, and this requires an understanding of how to transfer the heat from the plasma away from the samples to the cooled electrode. Helium backside cooling is the key, and understanding how to enable this for every wafer ensures success.

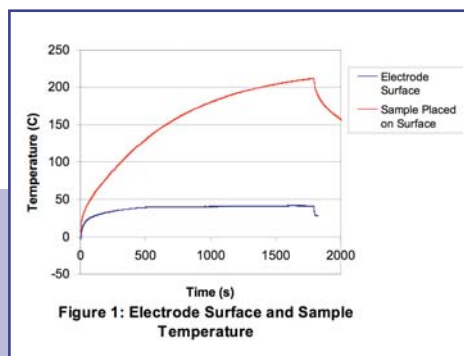


Figure 1

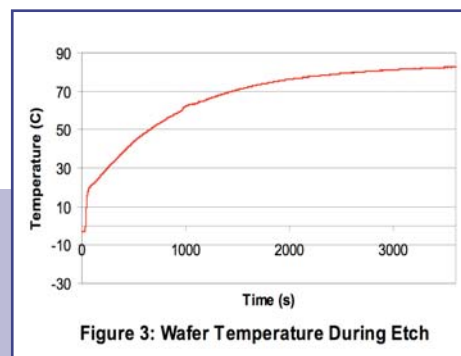


Figure 3



Figure 4

Semi-Polar (11.2) GaN on m-Plane Optoelectronic Device Performance

Larry Leung, PhD, Product Manager, HVPE Products

In the past decade, Group III-nitride materials have been widely used for visible and ultraviolet light emitting diodes and blue, violet laser diodes. Most of these optoelectronic devices are typically fabricated on the conventional polar (0001) c-plane oriented substrate materials.

Devices grown on the polar substrate orientation suffer undesirable spontaneous and piezoelectric polarization that give rise to significant band bending in the quantum well, hence reducing the radiative recombination efficiency and lowering the device performance.

Therefore, growth of GaN-related devices along semi-polar and non-polar directions has been studied intensely in order to diminish these polarization effects. Recently, the technical team at Oxford Instruments-TDI, led by Dr. Alexander Usikov, has made significant progress in solving this problem. Using hydride vapour phase epitaxy (HVPE), the team has

grown high quality, semi-polar (11.2) oriented GaN on (10.0) m-plane sapphire with an intermediate layer between the sapphire substrate and the GaN layer.

The semi-polar (11.2) GaN layers were grown in the temperature range from 930 to 1050°C in an inert argon ambient at atmospheric pressure. Gallium and aluminum were used as metallic source materials and hydrogen chloride (HCl) and ammonia (NH₃) as the active gases for the HVPE process. The epitaxial growth of GaN was performed at approximately 60µm/per hour using an intermediate layer deposited on m-plane sapphire followed by an undoped GaN layer. The growth procedure results in high quality, semi-polar GaN layer with thickness up to 30µm.

Figure 1 demonstrates the XRD ω -scan rocking curve of symmetric (11.2) reflex measured for a 2-inch (11.2) GaN/m-plane sapphire wafer. The GaN layer thickness is about 25µm. The XRD spectrum has a full width at half maximum (FWHM) of 286 arc-sec, illustrating the high crystalline quality of the layer.

The GaN layer also exhibits smooth surface morphology with some macroscopic surface modulation. Figure 2 shows the optical micrograph (image width of 60µm) of (11.2) oriented GaN layer grown on m-plane sapphire.

Atomic force microscope (AFM) results show the rms surface roughness of 3.7nm for a 2µm x 2µm scan.

This new material has generated a lot of interest within the nitride R&D community.

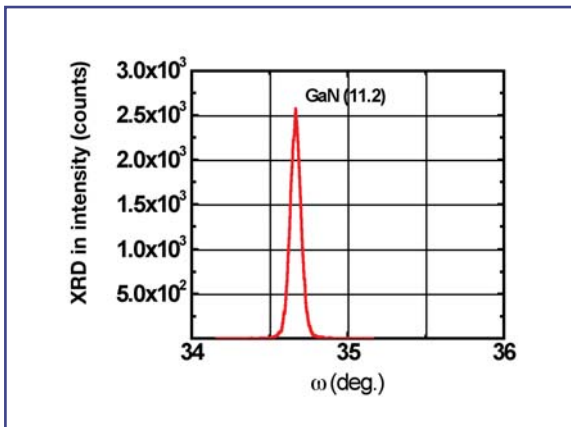


Figure 1

Proudly introducing...CrystalFlex

OIPT's multi wafer HVPE reactor providing superb epitaxial growth control

OIPT has just launched the **CrystalFlex**, tool which allows long lasting, high growth rate processes for high quality GaN and AlGaN single crystal materials. This equipment enables significant improvements in quality, stability and efficiency of crystal growing technology, and has been developed by our Oxford-Instruments-TDI team of scientists and engineers, based at Silver Spring, USA and at our UK facility. The key benefit of this new technology is the ability to produce multi-wafers, thus progressing through from R&D to production with ease.

For more on this great new tool, please contact us at our Head Office or Silver Spring – details on the back cover.

Sapphire by HVPE to increase ce

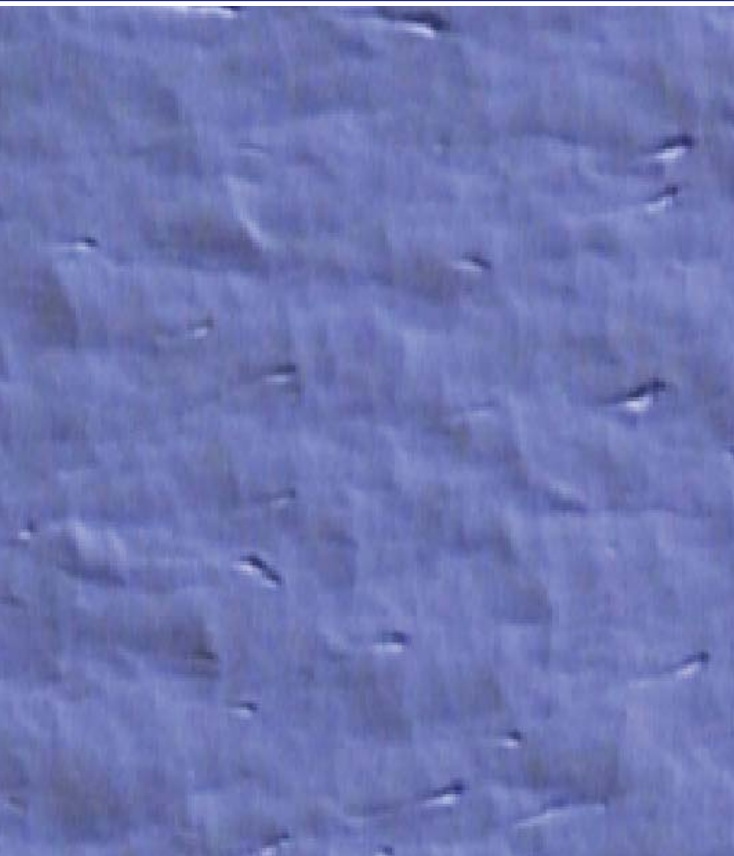


Figure 2

New HVPE Datasheet

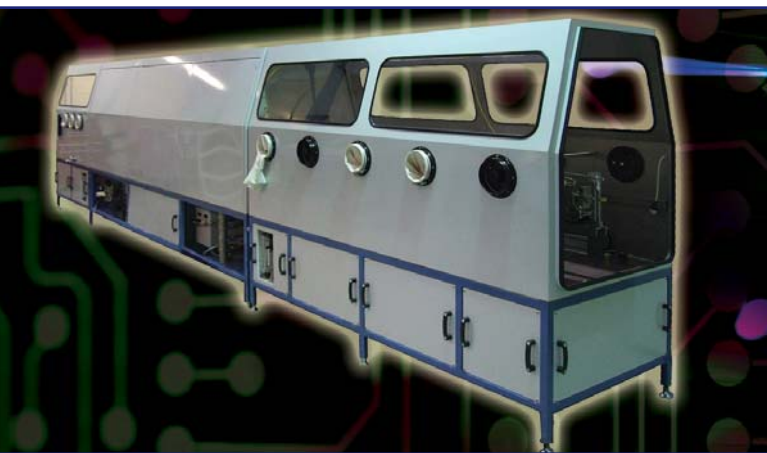
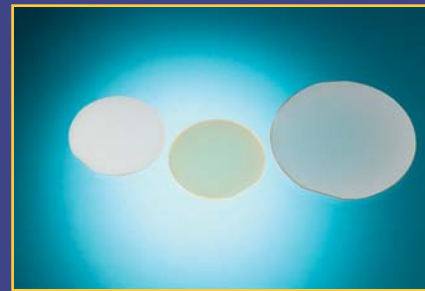
A new HVPE datasheet has just been released for AlGaIn on Sapphire templates

Hydride Vapour Phase Epitaxy (HVPE) processes and techniques are used in the production of novel compound semiconductors such as GaN, AlN, AlGaIn, InN, InGaIn.

TDI's processing capabilities include:

- Custom design Epitaxy
- Many templates are supplied from stock
- Low to medium volume templates on 2", 3" & 4" wafers as standard
- Research and development programmes & contracts undertaken for specific client requirements.

You can find the datasheet on our website or email us at process.news@oxinst.com for more information



CrystalFlex

CrystalFlex leading edge technology offers

- Over 25 years experience
- Multi wafer capability
- Thick GaN layers quicker than MOCVD
- R&D through to Production tool

A new technique for eliminating mask undercut in cryogenic silicon etching

Dean Stephens, Senior Applications Engineer, OIPT

For the fabrication of sub-micron silicon features for MEMS applications it is necessary to form openings with vertical sidewall profiles, and to maintain the critical dimension defined by the previous lithographic steps.

Plasma etching of silicon at cryogenic temperatures - typically in the range -150°C to -50°C produces such vertical sidewall profiles.

In cryogenic etching, anisotropy is facilitated by sidewall passivation provided by SiO_xF_y condensation at these low temperatures. This method has the advantage that it does not rely on polymer formation to provide sidewall passivation and hence does not affect the critical dimension. The anisotropy of the etch, being controlled by temperature and oxygen content, allows control over the sidewall angle.

A small amount of mask undercut is often however, an unavoidable feature of cryogenic etching, reducing the silicon etch depth that can be attained during the etching of sub-micron features due to mask lift-off. OIPT has previously patented a technique "Oxy-thermal Burst" that produces enhanced passivation during the initiation of the silicon etching, practically eliminating undercut and allowing deep silicon etching of sub-micron features.

This technique primarily utilises two steps, and controls the undercut by temporarily altering temperature and oxygen content, allowing greater control over initial sidewall slope / mask undercut. This technique is applicable to any form of Cryo-etching, i.e. in both RIE or ICP tools and etching any suitable material.

OIPT has now evolved the concept further and developed a method that continuously varies the sidewall passivation over the course of the initial portion of the etch, which has been shown to completely eliminate the problem of mask undercut.

Work was carried out on a **Plasmalab**System100 ICP180 fitted with a cryogenic electrode, using variations of the two step "oxy-thermal burst" process, tuning process parameters such as pressure, RF power and gas flows. It was found that this approach could merely reduce the amount of notching, or undercut, seen but could not fully eliminate it.

A strategy was then used that included performing a physical sputter process on the wafer, pre-etch, in order to expose some trench sidewall for passivation to form on the sidewall from the very beginning of the "etch proper". This was found to reduce the notching effect, creating a reproduction of the mask facet angle beneath the mask - effectively reversing the angle of the notch.

At this point, it was noted that during two step processing, the depth of the undercut would correspond with the etch depth of the first step when performed alone.

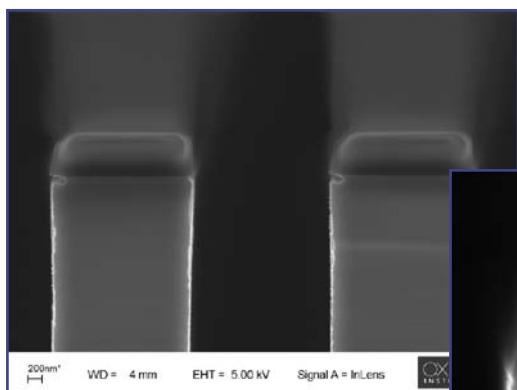


Image showing Cryo-etch mask undercut

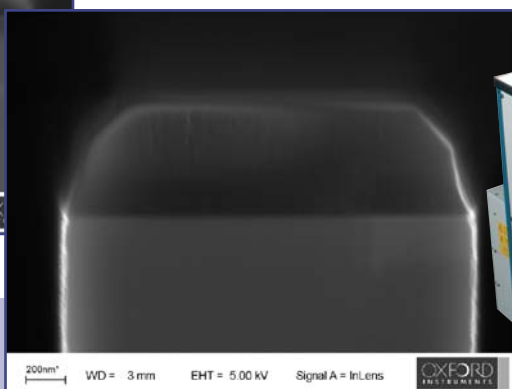
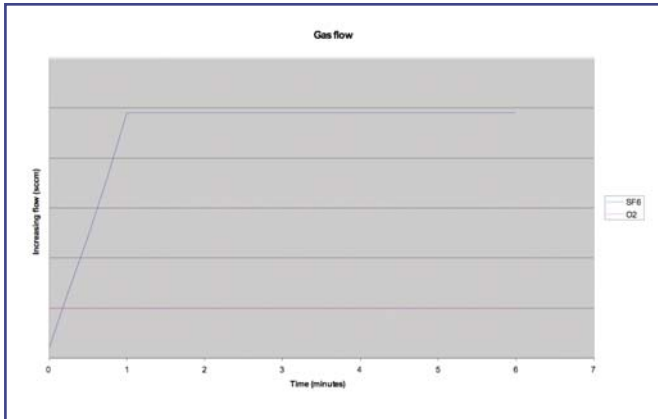


Image showing reduced undercut using Oxy-thermal burst



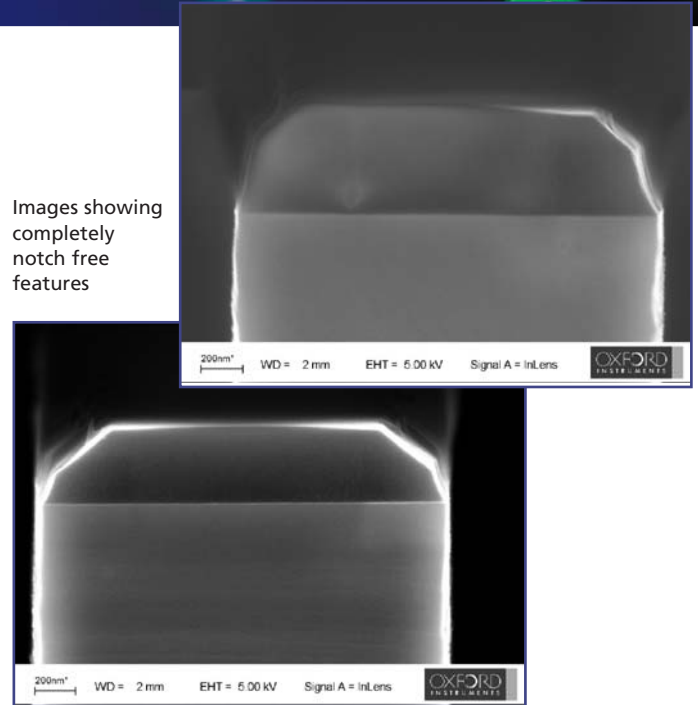


Graph showing ramping of SF₆ flow against O₂ flow to give required gas ratio

It was then decided that, perhaps, the best solution would be to ramp the O₂:SF₆ ratio, in the initial portion of the etch – mimicking the two step process' initial high ratio of O₂:SF₆, but, using parameter ramping, to gradually reduce it in stages until the main etch step began. This gave superior passivation coverage at the top of the feature to better resist breakdown, during the main etch stage, of the "thinned" passivation at the top of the trench.

The initial conditions of this etch virtually eliminated the notch, proving very encouraging. Work then concentrated around establishing the optimum conditions for the O₂:SF₆ ramp, to give a notch free etch. Conditions were found which accomplished this, repeatedly giving no notch at the top of the etch trench.

Images showing completely notch free features



The exact curve of this "passivation ramp" will be different for each individual mask – it is clear from work already carried out that the value is simply tuned and that individual masks are easily catered for.

These process modifications have shown that smooth sidewall cryogenic etching can, indeed, be performed without the inherent problem of mask undercut, thus no longer limiting the usefulness of this technique in sub-micron feature etching.

Solutions in Etch Deposition and Growth

- Plasma Etch & Deposition
- Atomic Layer Deposition
- Ion Beam Etch & Deposition
- Nanoscale Growth Systems
- Hydride Vapour Phase Epitaxy

We provide precise controllable and repeatable etching, deposition and growth of micro and nano structures



Decreasing Cost of Ownership for HBLED Customers

Bob Gunn, Applications Team Leader, OIPT

A key element in achieving a repeatable process is to ensure that the chamber is kept as clean as possible. Some processes produce by-products that build up on chamber components over a period of time, and can either lead to a process drifting out of specification and/or a particle issue.

One means of removing this build up of product is to open the chamber and physically clean the components with the appropriate solvents and cleaning agents. This is costly in terms of man-power, time, the system being non-productive etc. Once the chamber is cleaned, the time taken to reach base pressure, re-qualify the system for production etc must be taken into account. Anything that can be done to increase the time between a mechanical clean of the chamber has a great benefit on system uptime and productivity.

Changing the process chemistry such that it eliminates the non-volatile by-products is one solution, but unfortunately this is not always possible. For instance, one case is Sapphire etching, primarily used in the production of

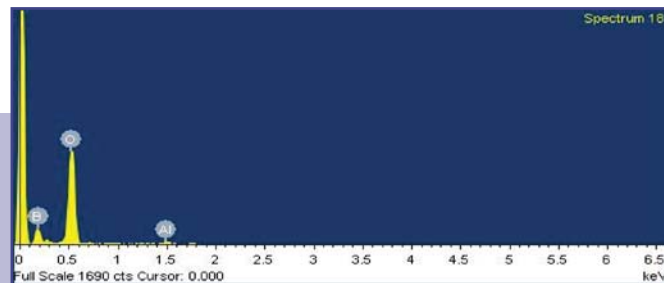
HBLED's where the optimum process is based on using a BCl_3 chemistry. After 10-15 etch runs the chamber needs to be opened as the build up of by products becomes so great it starts to produce particulates which are detrimental to the device performance. (See picture 1 and 2)

Another approach to increasing the time between mechanical cleans is to develop an in situ clean, which effectively uses another plasma gas chemistry that etches away the non-volatile products, leaving the chamber clean. This in situ clean is used periodically before the chamber build up gets too thick to become problematical. After performing the clean, which often uses a gas chemistry which may affect the device process, a conditioning run is carried out using the device process chemistry and also dummy wafers, to ensure the system is ready to run production wafers. This condition process also needs optimisation to minimise the time to producing wafers again.

OIPT has been developing an in situ clean to extend the mean time between mechanical cleans for a Sapphire etch, with a large HBLED manufacturer. The customer is using a **Plasmalab**® System133 ICP380 to etch batches of 2" sapphire wafers. This requires a mechanical clean every 2-3 days, takes the system out of operation for 16-24 hours, and is unacceptable as the production of HBLED's increases.

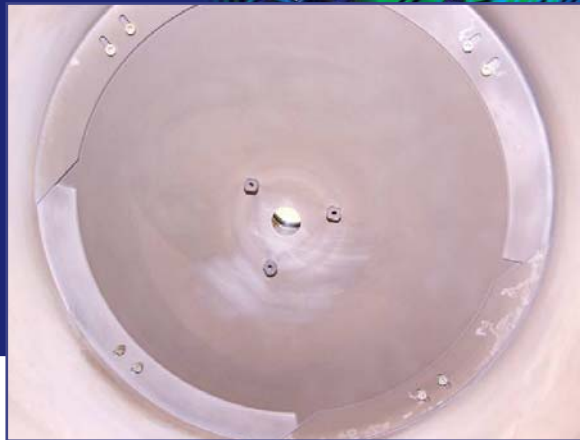
Initial trials were based on a CF_4/O_2 chemistry. This did have limited success, increasing the meantime between mechanical cleans to 18 process runs before requiring a mechanical clean. To improve this further a rigorous study was undertaken.

EDAX and SEM analysis of the material deposited showed a crystalline type structure and the material was BxOy (see picture 3 and 4). Based on this analysis O_2 was removed from the clean as it was thought this would aid the formation of more BxOy . SF_6 was chosen as the basis for the clean chemistry to try and form volatile by-products. To maximise the amount of free F in the plasma high ICP powers and high flows of SF_6 were selected.





Picture 4



Picture 5

To ensure that the process clean was run under the same conditions each time, ten sapphire etch processes were performed prior to a clean being run. Once the initial clean time had been completed, the chamber was opened for visual inspection. Depending on what was observed when the chamber was open either extra time was given to clean, or a mechanical clean was performed to start another experiment from a clean chamber.

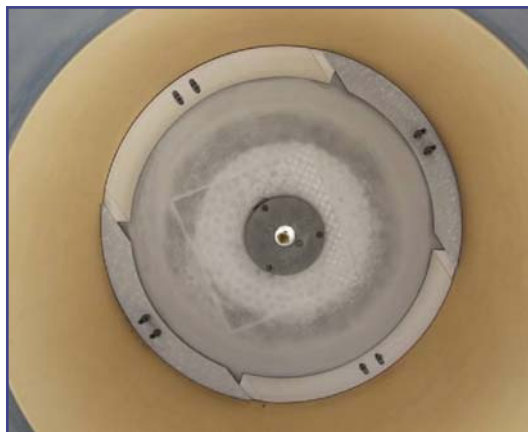
It was found in this initial study phase that higher ICP powers with moderate RF bias gave the best results. (see picture 5). In consultation with an HBLED manufacturer the time was considered too long, and they were concerned about long term running of their systems at higher powers.

A new approach was needed. To shorten the time of the clean required that fewer sapphire etch runs were performed prior to running it, as it was found the clean time did not increase linearly with the number of sapphire runs. Experiments were also carried out with various changes to system configuration as well as process parameters.

After many experimental iterations and discussions with the customer a running regime was agreed of three process runs, clean, condition then repeat. Optimisation of both the clean process, still based on SF₆, and the

conditioning has to be carried out to ensure a rapid return to running production wafers. The process performance ie etch depth, CD etc., has been checked after each iteration of the process cycle (process, clean, condition, process), to ensure that this was within specification. After several cycles of this the chamber was opened which showed it was very clean (pictures 6, 7, 8 and 9).

This new process regime is now under trial at the customer site with very encouraging results.



Picture 6 Pre test runs



Picture 7 Pre test runs



Picture 8 Post etch tests



Picture 9 Post etch test

Oxford Instruments celebrates order from prestigious new university in Saudi Arabia

Oxford Instruments is pleased to announce a substantial multi-system order from the newly built King Abdullah University of Science and Technology (KAUST) in Saudi Arabia. This large order comprises multiple plasma etch, deposition & growth systems.

These tools will equip the Nanofabrication Core research facility, and include key Oxford Instruments Plasma Technology (OIPT) systems: several **Plasmalab**®System100 tools for RIE and ICP etch, and PECVD; and a **FlexAL**® Mk II atomic layer deposition tool.

Oxford Instruments has extensive experience in supplying multi-system installations to both the academic and industrial sectors, a key recent example being Southampton University, UK where OIPT has a number of its tools installed in a large research laboratory.

Dr. Mohamed Samaha, VP Research Development at KAUST, comments, "These equipment are for our Nanofabrication Core Lab, and comprise tools for nano-material fabrication incorporating etching, deposition and growth. These will make our core labs among the most advanced in the world. Researchers at KAUST will be able to utilize these tools in the clean room for the manufacture of nano-materials to advance the research agenda at KAUST."

Mark Vosloo, Sales Director for OIPT is delighted with the order, "This significant order from a major Saudi Arabian facility with a strong commitment to nanofabrication research is clearly excellent business for OIPT. We are confident this is the start of a long relationship, and are delighted to be involved at the inception of KAUST University."



Oxford Instruments announces multiple system orders for Diamond Like Carbon (DLC) process applications

We recently received multiple orders for our advanced **Plasmalab**®System133 cluster tool. These systems will be used for the deposition of Diamond Like Carbon (DLC) – a process used in the manufacture of power devices. DLC coatings have the right electrical resistivity to make high power semiconductors work at ever higher voltages and OIPT was one of the first companies to prove this process in 1995, successfully transferring the process from the laboratory to large scale production. OIPT's range of production tools offer excellent uniformity, reproducibility and high-throughput processes, offering both single wafer or cassette load wafer handling options with integrated process control, making them ideally suited for this application.

The power semiconductor industry for automotive, industrial electronics, robotics and process automation demands chips which can carry more power, with greater reliability.

Mark Vosloo, Oxford Instruments Plasma Technology's Sales Director comments, "Our many years of expertise in the DLC process based on our System133 cluster tool, ensures that we can meet demanding customer requirements. The company's proven process capability and reliable tailor made solutions, for these and many other challenging processes and market applications, is the reason we are the supplier of choice for these customers."



Getting the very best service and support from Oxford Instruments

Our global service team is backed by regional offices, offering rapid support wherever you are in the world and as part of our commitment to support our customers. We've recently recruited additional service engineers in Germany, the UK and Asia, in order to respond to our customers' needs even more quickly.

Visit www.oxford-instruments.co.uk/support/plasma-technology to find out the latest offerings from OIPT support.



PlasmaWorld...

Plasma Etch Tech 2009

Pushing the Limits

Seminar at LBNL, CA, USA – 16-17 July 2009

One in a series of Oxford Instruments' joint seminars & workshops, including a talk by Dr David Henry, Caltech, USA.

Abstract: Alumina masking for silicon etches in Oxford Instruments' **Plasmalab** System100.

By using sputtered aluminum oxide (alumina) as a resilient etch mask for fluorinated silicon inductively coupled plasma reactive ion etches, remarkable aspect ratios for silicon pillars are demonstrated. We demonstrate here selectivity's of 5000:1 for cryogenic silicon etching and 68:1 for SF_6/C_4F_8 silicon etching. Nanopillars with diameters ranging from smaller than 50 nanometers up to several hundred nanometers, are etched to heights greater than 2 microns. Micropillars of 5, 10, 20, and 50 micron diameters are etched to heights of over 150 microns with aspect ratios greater than 25. Patterning of the etch mask is achieved using standard liftoff techniques and characterization of the sputtered alumina is discussed.

M.D. Henry, S. Walavalkar, A. Homyk, A. Scherer, Alumina etch masks for fabrication of high-aspect-ratio silicon micro- and nanopillars, *in submission (2009)*.

For the full programme & to register for this or the other Oxford Instruments Plasma Technology seminars in 2009 please contact process.news@oxinst.com. (Full seminar listing on back cover)

New Faces at Oxford Instruments



Knut Beekmann
Product Manager



Norman Bolam
Finance Director



Rob Turner
Customer Support Engineer



Ian Mason
Customer Support Engineer

FlexAL® Enhancements

A new generation of **FlexAL** tools has just been launched, with up to eight rapid bubbled liquid or solid precursors.

In addition, the three common oxidants can be fitted; O_2 plasma, H_2O and ozone. Including up to ten gas precursors, the industry leading **FlexAL** is now even more flexible.



Oxford Instruments wins Best Technology Award

Oxford Instruments plc has won the award for Best Technology Company 2008 at the annual PLC Awards. Sponsored by Price Waterhouse Coopers, The Financial Times and the London Stock Exchange, the awards reward excellence amongst the smaller companies quoted on the London Stock Exchange. The Best Technology Award is given to companies whose business growth and success is attributable to the development of technology led products and services.

Chief Executive Jonathan Flint said "We celebrate 50 years of scientific

excellence and innovation this year, and our technology is at the core of our success. Our strength is in the talent and expertise of our staff and I am proud to accept this award on their behalf".

Pictured (l to r): Ian Powell, Delphine Currie of SJ Berwin LLP (sponsors of the Best Technology award), Jonathan Flint (Chief Executive, Oxford Instruments), and Penny Smith from GMTV.



Events roundup

Oxford Instruments Plasma Technology will be exhibiting at the following:

ALD Workshop
OIPT/Cornell University
19 May 2009
Cornell University, Ithaca,
USA

EIPBN Conference
26 – 29 May 2009
Florida, USA

SEMI Expo CIS
1 – 3 June 2009
Moscow, Russia

S2K Conference
2 – 3 June 2009
Cardiff, UK

Blue2009
8 – 9 June 2009
Hsinchu, Taiwan

Opto Taiwan
10 – 12 June 2009
Taipei, Taiwan

ALD 2009
19 – 22 July 2009
Monterey, CAL, USA

**Innovation in Processing
at the Nanoscale**

**Plasma Seminar OIPT/
Southampton University**
2 July 2009
Southampton, UK

Semicon West 2009
14-16 July 2009
San Francisco, USA

**Plasma Seminar
OIPT/Lawrence Berkeley
National Laboratory**
16 – 17 July 2009
Berkeley, CA, USA

CSTC 2009
10 – 14 August 2009
Ontario, Canada

**Plasma Workshop
OIPT/Eindhoven University**
27 – 28 August 2009
Eindhoven, Netherlands

**24th European
Photovoltaic Solar
Energy Conference
(PVSEC)**
21-25 September 2009
Hamburg, Germany

MNE Conference
28 Sept – 1 October 2009
Ghent, Belgium

Semicon Taiwan
30 September –
2 October 2009
Taipei, Taiwan

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

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Joint Plasma workshops and seminars for 2009

Following our highly successful collaborative seminar and workshop at Caltech last year, OIPT plans to hold a series in 2009. Each seminar will have a wide programme, including talks by OIPT applications & development scientists, in addition to key guest speakers and researchers from the host University.

ALD Workshop 19 May
Cornell University, USA

Innovation in Processing at the Nanoscale 2 July
Southampton University, UK

Plasma Etch Tech 2009 16 – 17 July
LBNL, CA, USA

Plasma Workshop 27 – 28 August
Eindhoven University, NL

To register for a place at any of these seminars please email:
process.news@oxinst.com stating which one you are interested in attending.

Successful Mini-Seminar at UCSB, CA, USA

An overview of thermal and plasma ALD of oxides, nitrides and metals

This event, hosted by UCSB, attracted over 60 people from academia and industry.

The talk was given by Oxford Instruments' ALD Product Manager, Chris Hodson who introduced the fundamentals of ALD to those not already familiar with the technique.

An overview was given of the various reactor configurations and the hardware for plasma assisted ALD. Common ALD materials and their applications in optics and electronics were discussed in relation to film properties. The talk focused in particular on SiN_x, Ru, Pt, ZnO:Al and high-k dielectrics.



If you are interested in hosting a similar event, please contact your local sales rep or email: process.news@oxinst.com

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