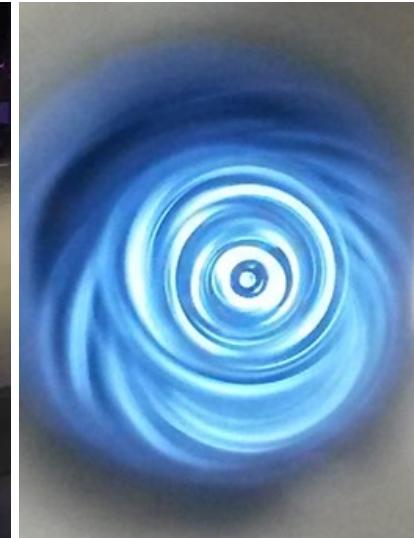




Gencoа subcontract services overview  
presentation for development of thin film  
coating structures, plasma treatment &  
process simulation services

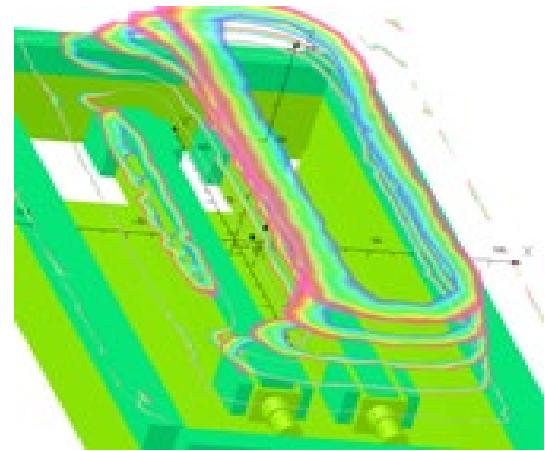
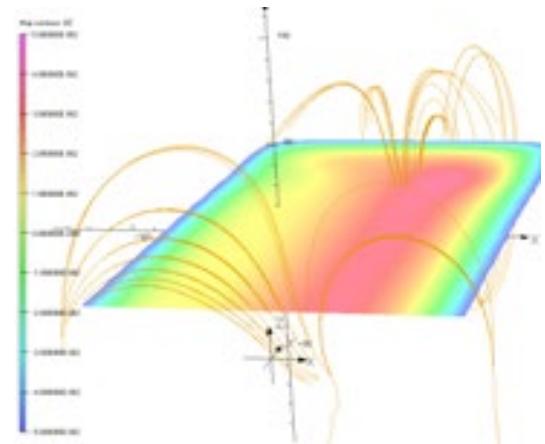
**Perfect your products and process  
with GENCOA Thin Film  
Components & Vacuum Technology**





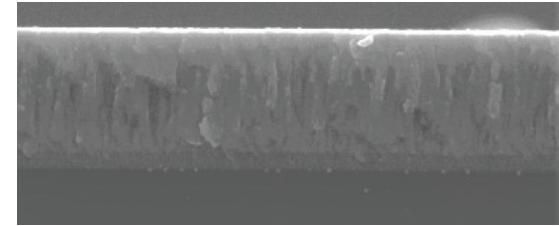
# Gencoa Key Company Info

- **Gencoa** is a private limited company (Ltd)
- Located in Liverpool, UK
- Critical component supplier to the vacuum deposition industry, 95% of products exported from the UK
- Products and development services for the plasma thin film deposition community
- One-stop ‘shop’ for layer and plasma product research and development services
- 39 employees with local sales or support staff in China, Germany & USA
- > 5000 magnetrons in the field
- > 3000 speedflo control systems in the field



# GENCOA Key Company Facts

- **GENCOA** is a private limited company (Ltd)
- Founded 1995 by Dr Dermot Monaghan
- Located in Liverpool, UK
- Employs 39 people
  - 3 design (Creo (Pro E) 3D CAD)
  - 6 process & product development & simulation
  - 12 assembly & test
  - 3 UK based sales and support
  - 4 sales & tech support in local markets (1 China, 1 Germany, 1 USA)
  - 6 administration & accounts
  - 3 hardware & software (Speedflo & OPTIX)





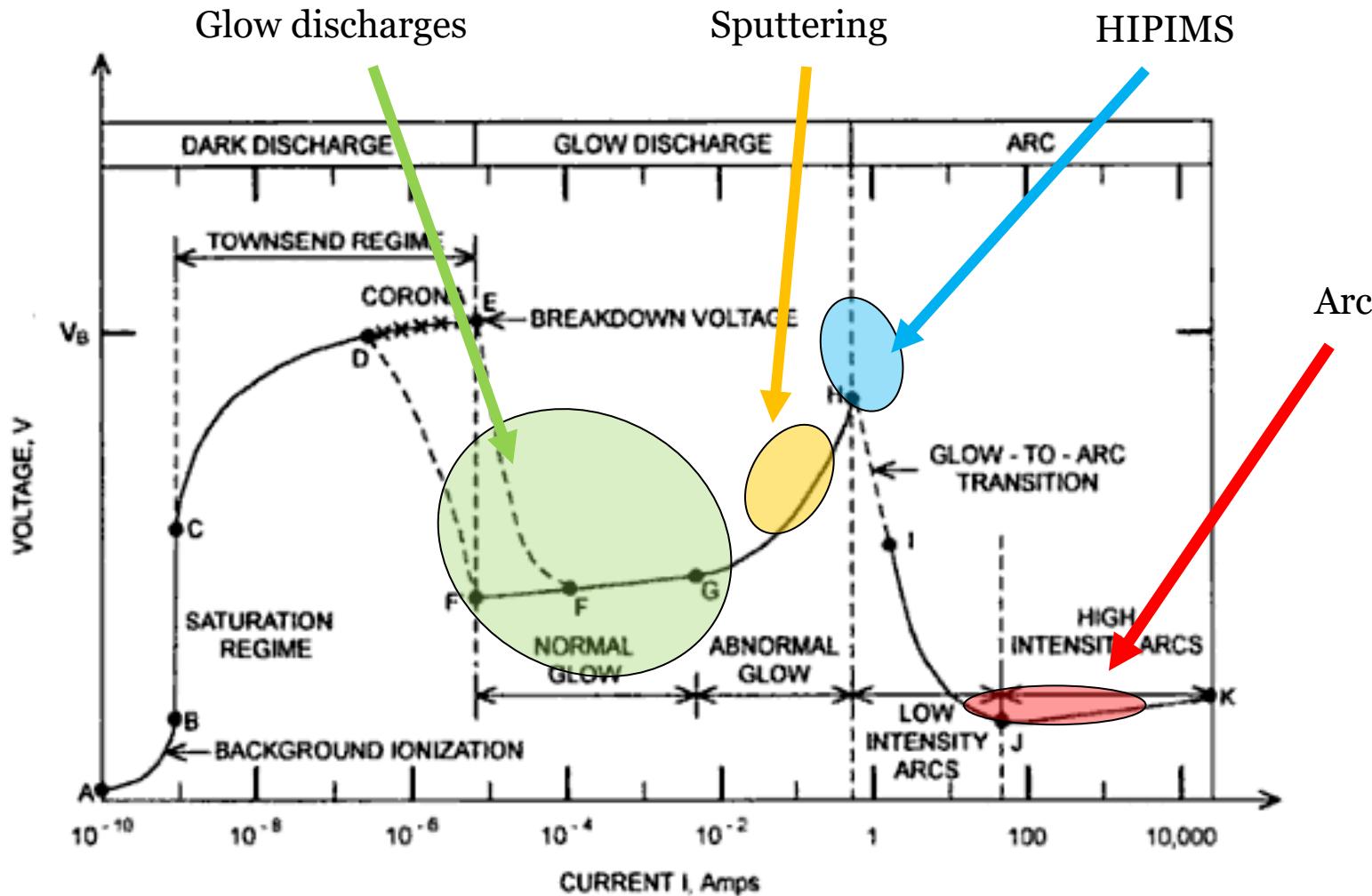
# Gencoa Purpose Built Factory

Purpose built factory completed May 2016  
27,000 sqft of office, manufacturing and R&D space





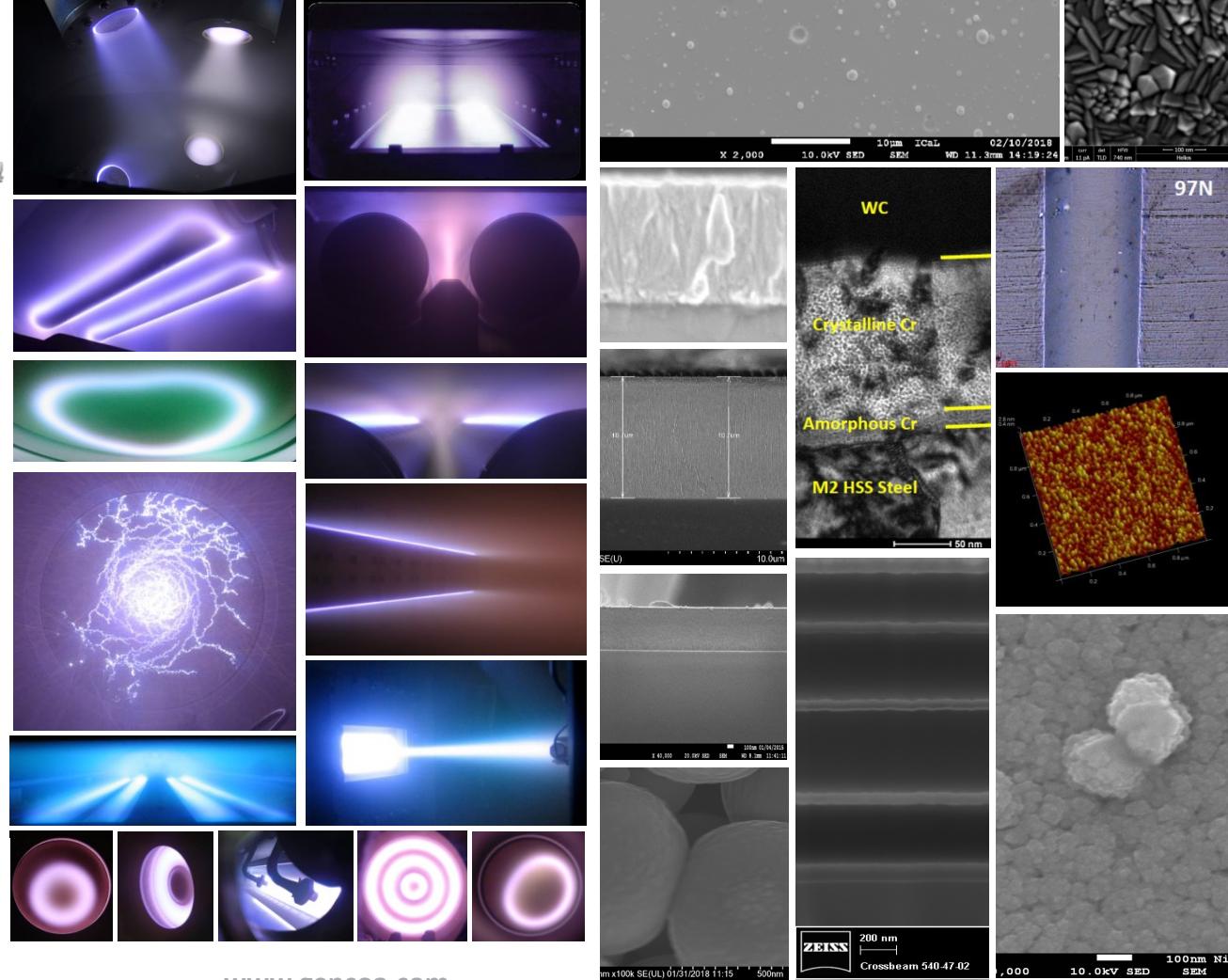
# Gencoa product and coating development services span the Plasma Spectrum





# 27 Years experience creating products and thin film structures

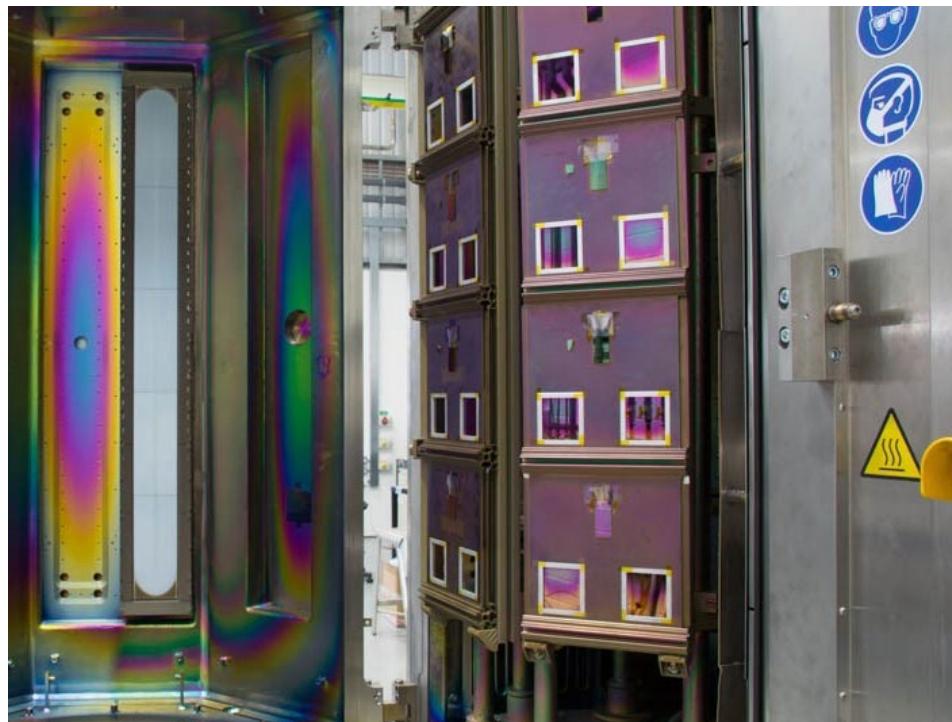
Rotatable & Planar Magnetron Sputter Cathodes • Retrofit magnetic packs • Plasma Treaters  
• Speedflo Reactive Gas Controllers • IM Ion Sources & power supplies • Arc MAX sources &  
power supplies • Active Anodes and Gas Delivery Bars • OPTIX Gas and Chemical Sensing • S  
and Se Sensor • PEC Pulsed Effusion Cell • V+DLC - Transparent DLC • IC Nano antimicrobial  
layer technology • Process implementation & tuning •



# Industrial experience and in-house development capabilities results in rapid thin film and plasma process results

Gencoa provides a unique mix of simulation, design & manufacturing combined with extensive test capabilities

- Gencoa R&D staff have been in place for many years and are able to quickly focus on different project elements to ensure rapid progress
- Most capabilities are in-house to minimise delays
- Gencoa is a ‘commercial’ company and seeks to achieve results in the most efficient and cost effective manner with agreed milestones and project planning
- All development work can translate to real-world production rapidly as all the methods we employ are suited to scale-up
- A prototype production system is available to ensure coated parts are available for performance testing and optimisation





# Gencoа has a very active R&D department and 8 vacuum systems for coating process development and source testing

Gencoа undertakes contract R&D services for customers.

Full range of sputter and plasma system, source, control and power geometries.

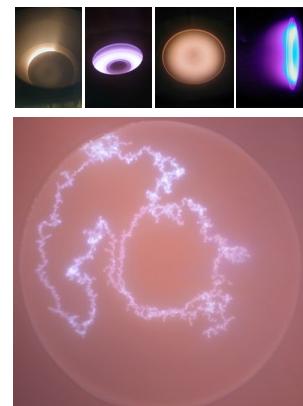
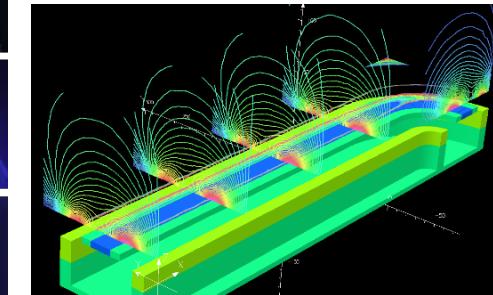
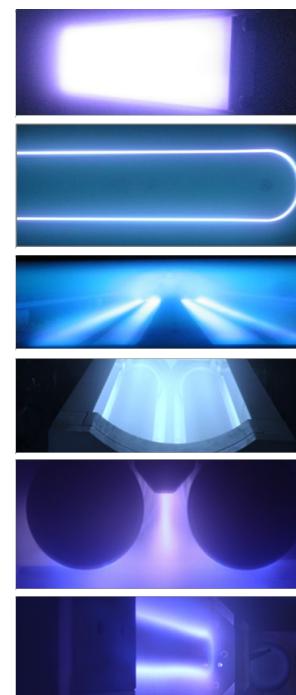
Rapid development phases by highly experienced staff members.



# R&D techniques and equipment

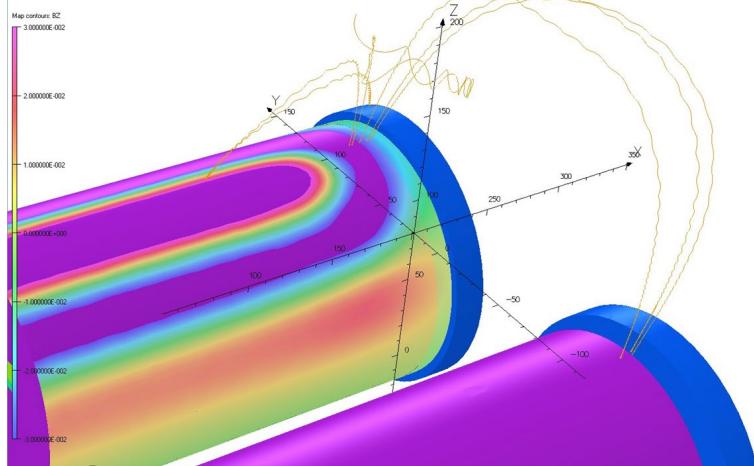
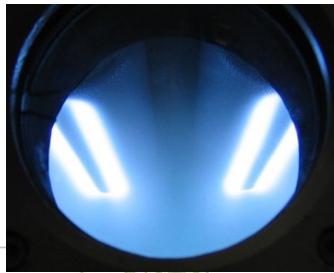
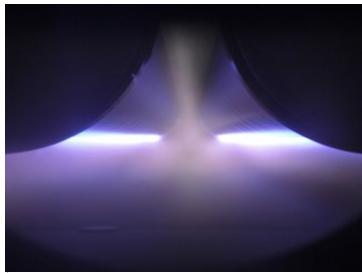
Gencoа combines scientific knowledge with practical application of various coating and plasma technologies

- 2 & 3D modelling and magnetic scanning
- Power Modes: DC, DC pulse, AC (AE Ascent & sinewave), RF, Hipims, Hip3<sup>+</sup>
- Planar and rotatable sputter sources in all configurations
- Circular Arc Sources
- Ion and plasma cleaning sources (6 types)
- Gas monitoring (OPTIX, RGA...)
- Plasma diagnostics (optical & Langmiur)
- Coating characterisation (SEM.....)
- Reactive Gas Feedback Control

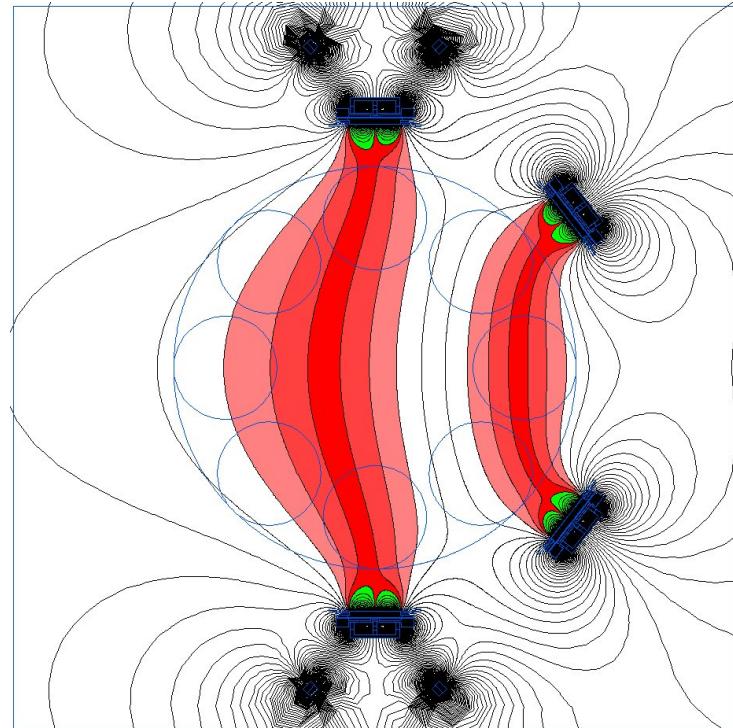


# Design of processes and system magnetic field arrangements

Gencoа provides 2 and 3d magnetic field modelling of multiple sputter and plasma sources mounted with a process chamber in order to optimise the process and thin film properties. Magnetic fields control the plasma electrons, hence it is critical to treat the whole process chamber as a single plasma zone. Gencoа also work in partnership with Nano4Energy in Madrid in the field of Hipims to ensure the power mode can be used to its full potential.



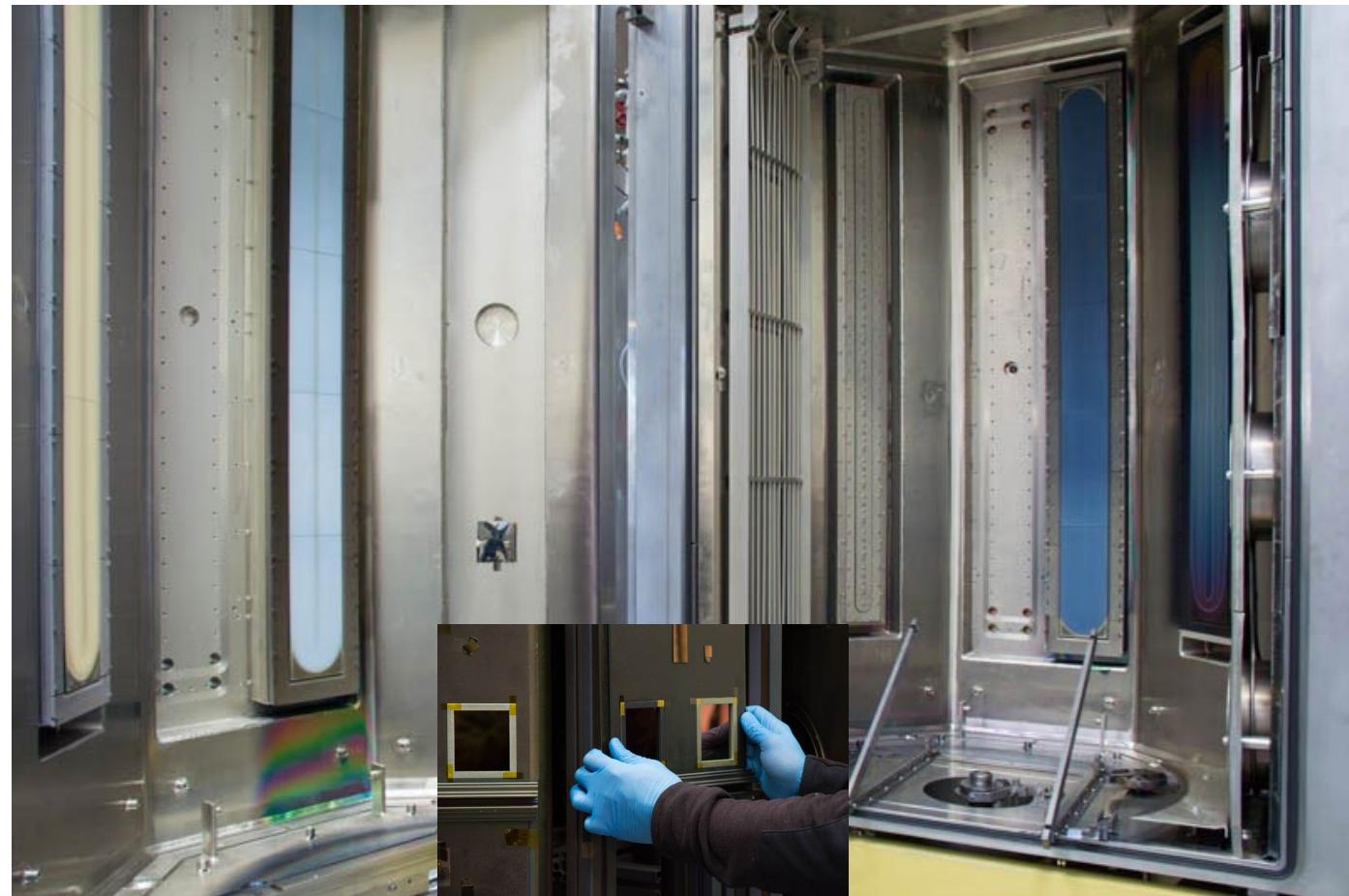
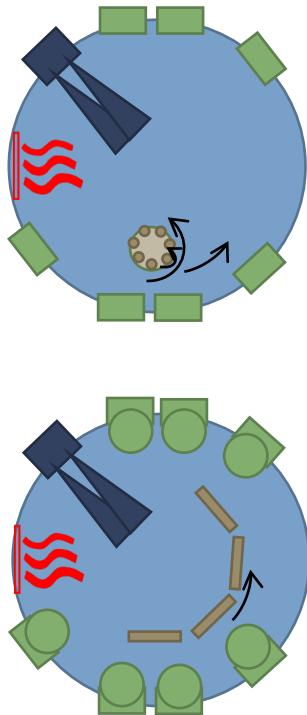
[www.gencoа.com](http://www.gencoа.com)



**nano4ENERGY**

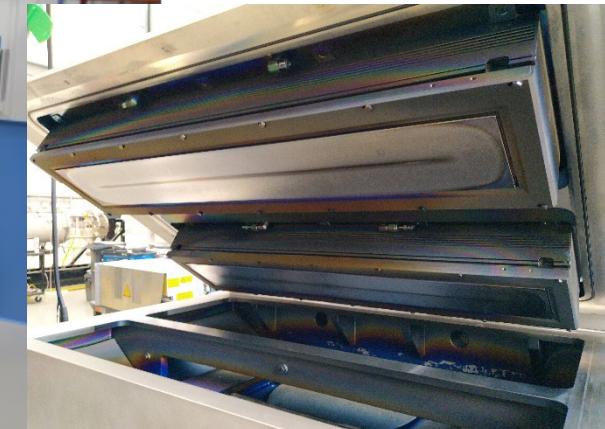
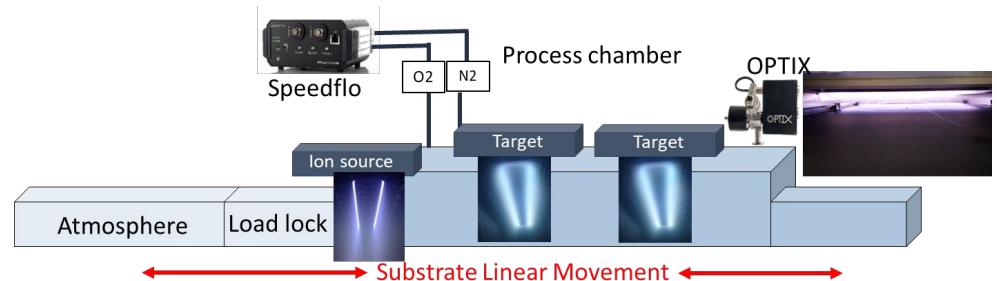
# 1.5m source development and test chamber Vertical with linear ion source pre-cleaning and 7 coating sources

Complex layer stack development and pilot production on 2D and 3D parts with all power modes and planar or rotatable cathodes



# 0.9m source development and test chamber in-line load locked Horizontal with linear ion source pre- cleaning and 2-3 coating sources

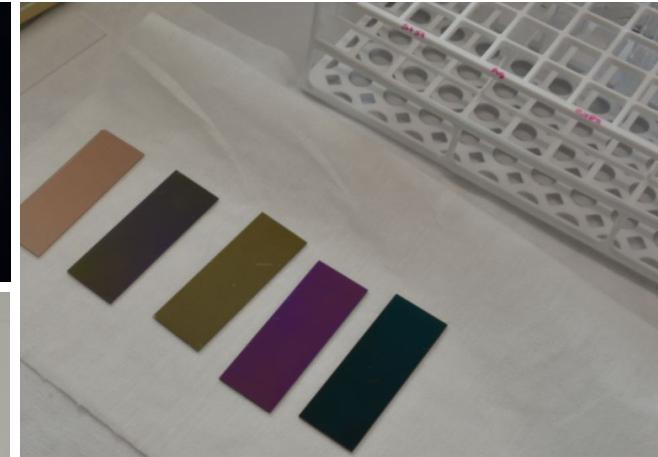
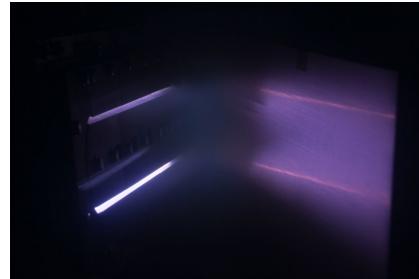
Development and pilot production on 2D parts, flat glass & plastic



# Small coating development system with 2 sputter sources and a linear ion source

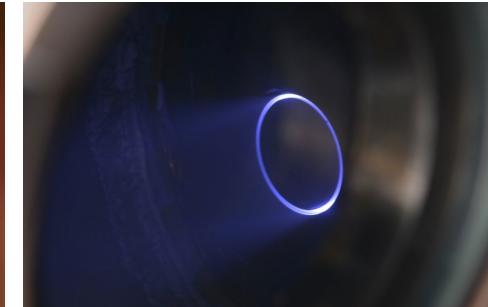
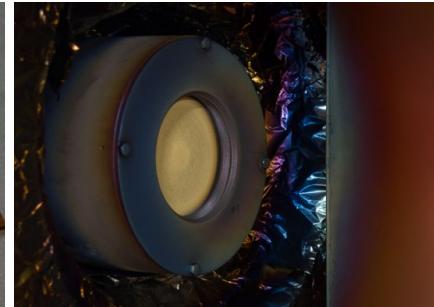
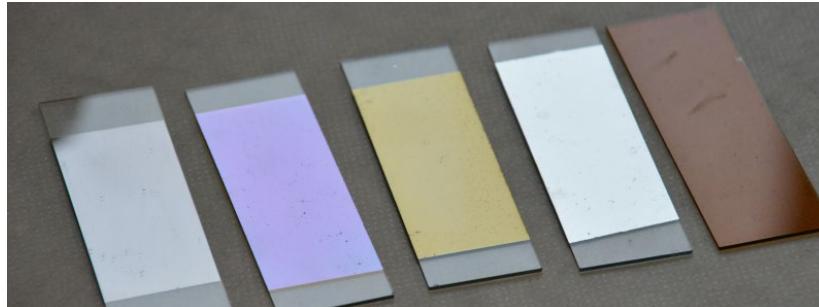
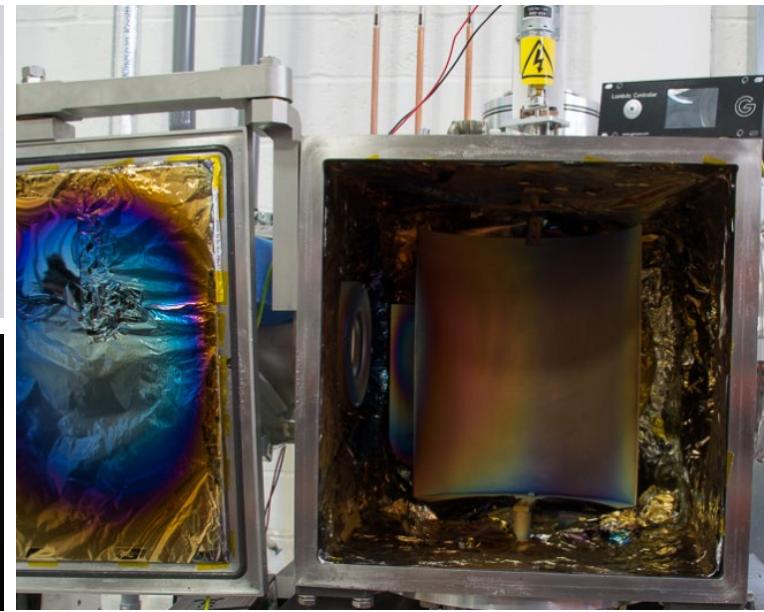
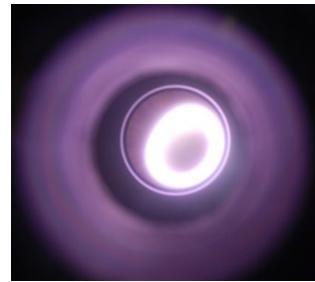
Flexible system to coat 2 & 3D part geometries

- Used to create a wide variety of layer types in reactive and non-reactive modes
- Has a 300 mm high coating zone
- 1, 2 and 3 axis part rotation
- OPTIX monitoring and SPEEDFLO feedback control



# Small circular source based coating development and test system

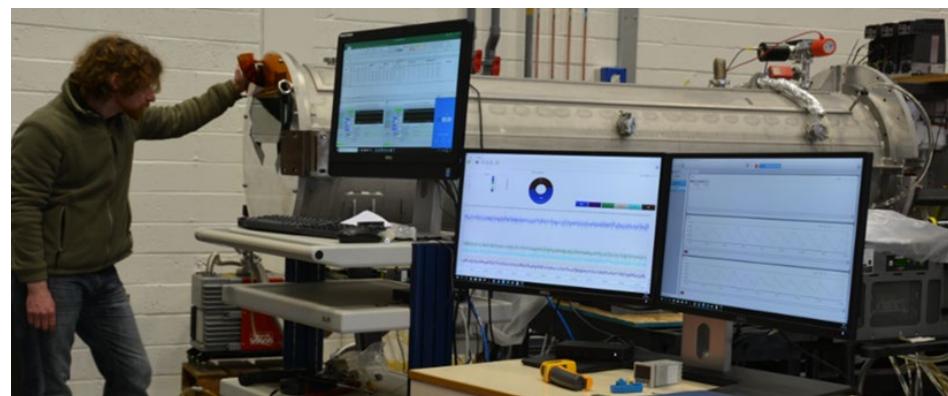
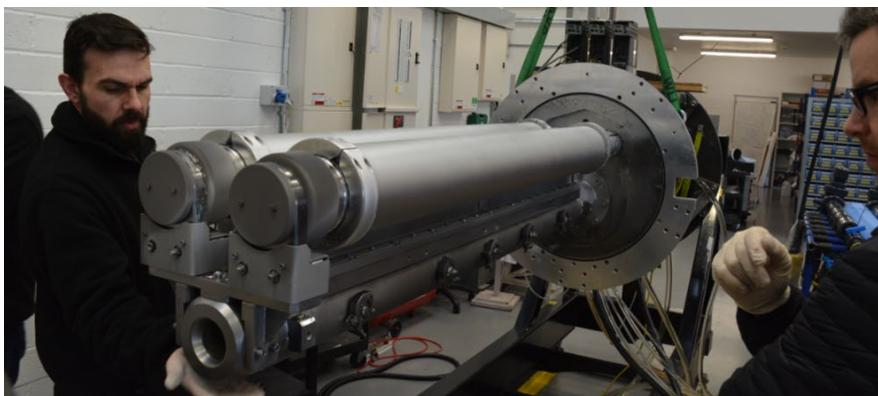
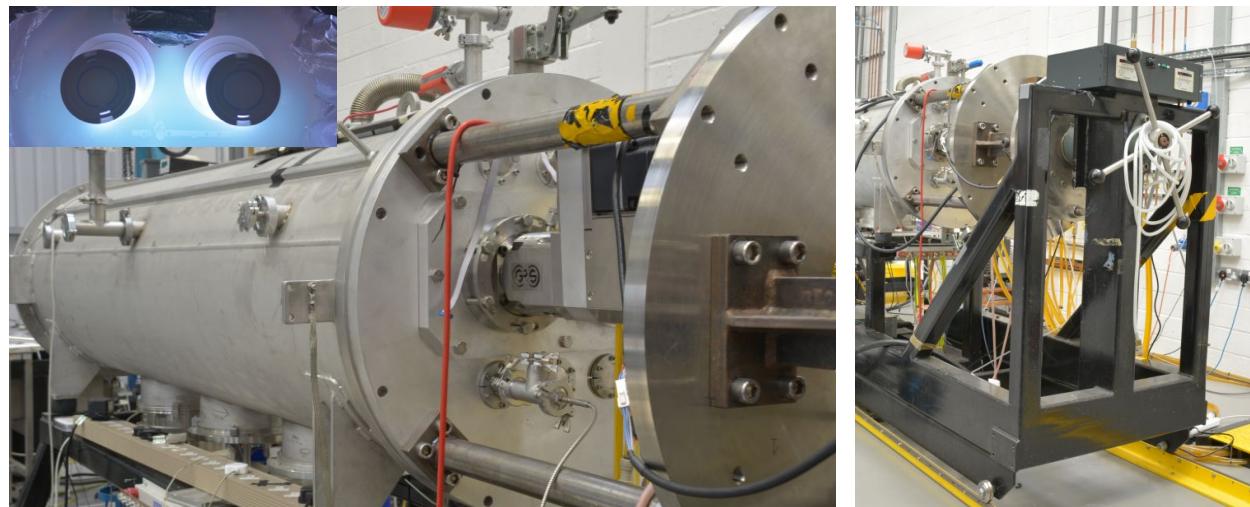
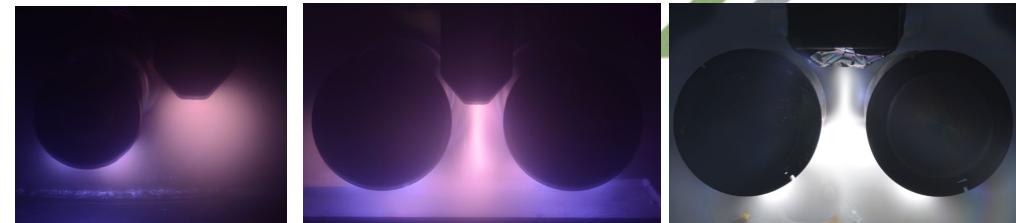
Combines ion cleaning with sputter deposition on small sized samples – typically glass microscope slides – initial layer development before scale-up



# 2.5 m source development and test chamber for cantilever mounted cathodes and dual rotatable cathodes and active anode

Flexible development system for upto 2m long rotatable targets on flat glass & plastic, with substrate heating and shutters

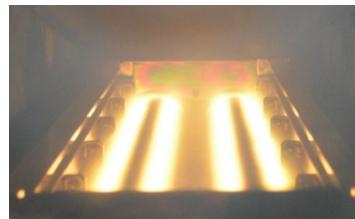
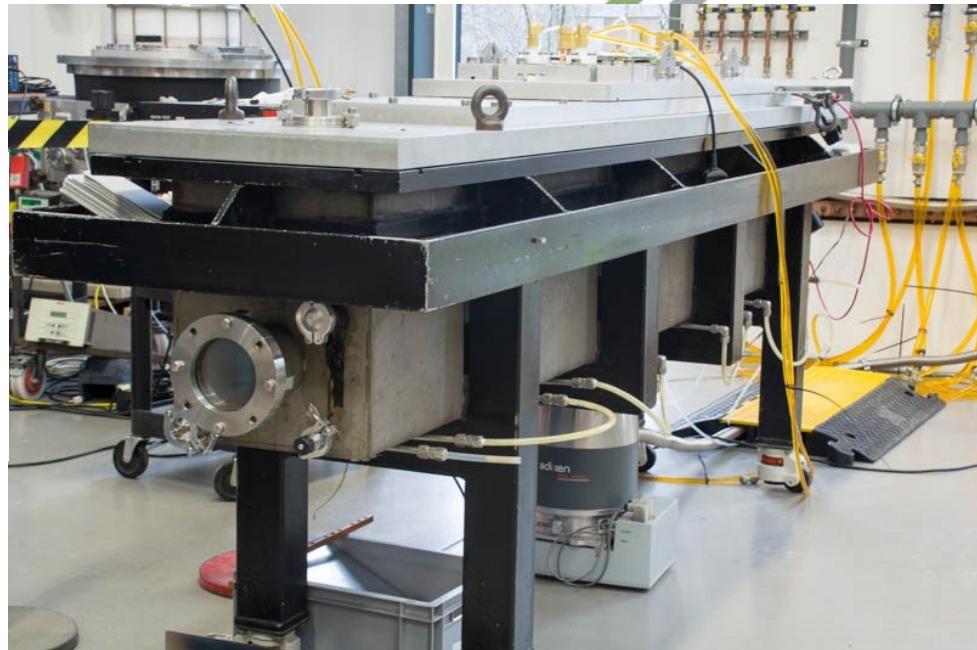
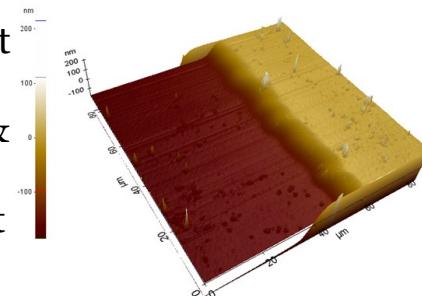
- Long term testing of GRSC rotatable magnetrons
- Substrate temperature studies
- New plasma treatment sources and improved substrate cleaning methods
- Deposition of G-DLC onto A4 size substrate with option heating
- CO<sub>2</sub> plasma cleaning studies with dual GRSC & AA



# 2.5m long test tank for planar and rotatable magnetron test and plasma source cleaning and etch studies

All geometries of single magnetron and plasma sources

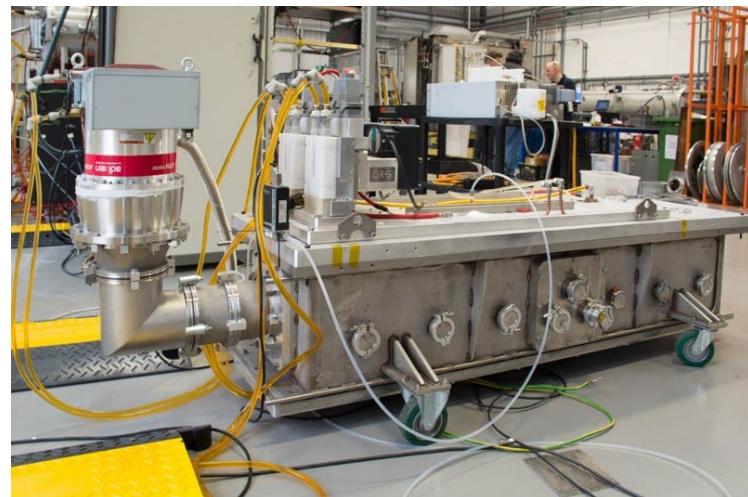
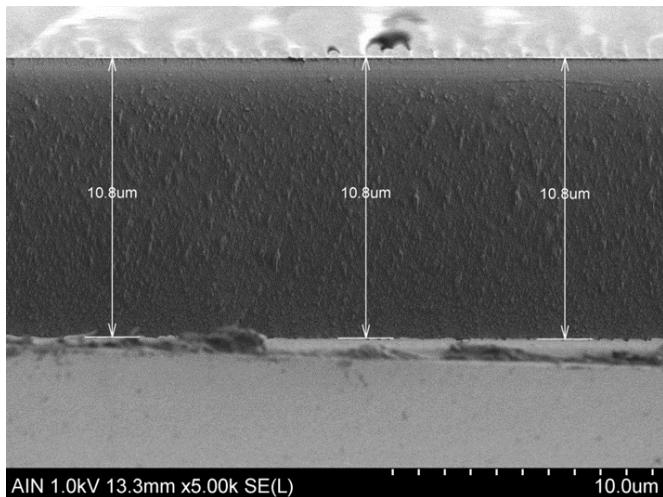
- Up to 200mm wide target
- Anode studies
- RF plasma distribution & uniformity tuning
- Magnetic field and target erosion optimisation



# 1.5m long ‘wider’ test tank for dual planar and rotatable magnetron tests, CO<sub>2</sub> plasma source cleaning and etch studies

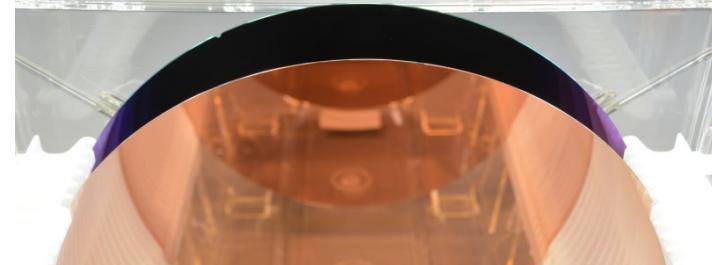
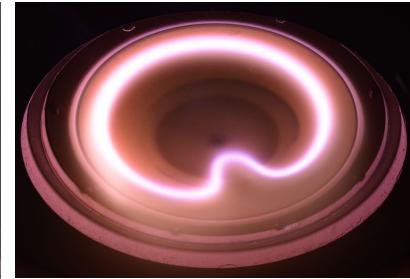
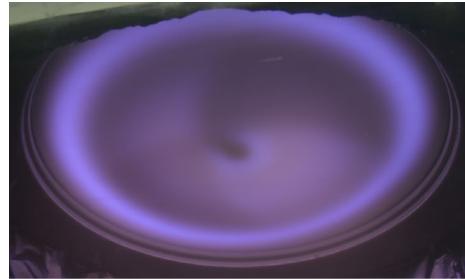
Suitable for dual rotatable or dual planar magnetrons

- Active anode studies, substrate heating and target voltage reduction tests
- Deposition of reactive layers with Active Anodes and different power modes



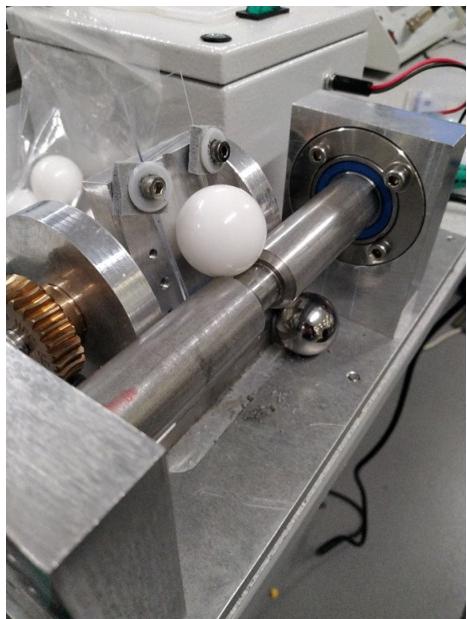
# Development and test chamber for FFE circular targets and coating deposition onto silicon wafers

Layer creation on wafers with FFE magnetrons, testing of uniformity with new magnetic ffe designs, different power modes and reactive gas





Gencoа have a range of in-house testing to rapidly assess the nature of the coatings and use local Universities and Laboratories for more in depth analysis

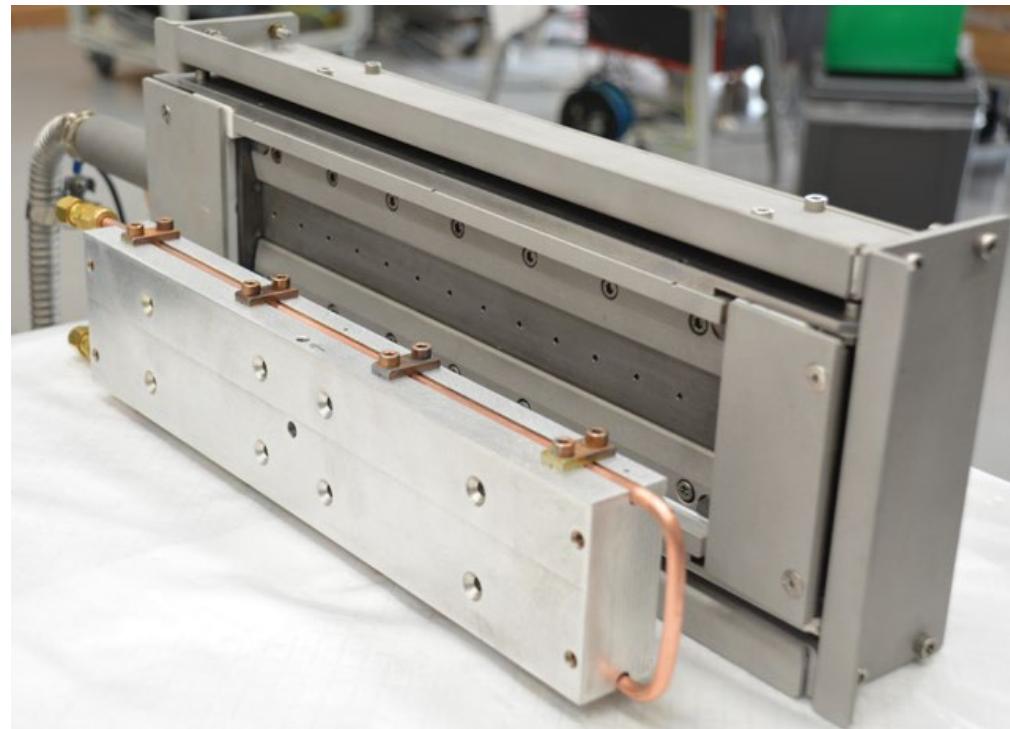




# Need a special source? Gencoа can design and test



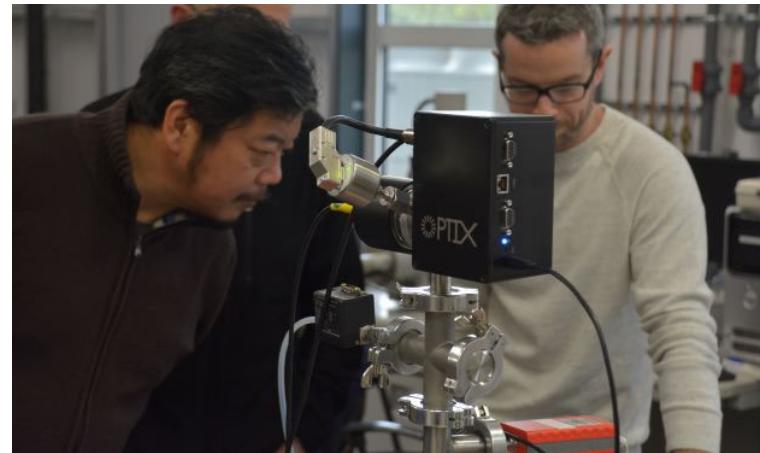
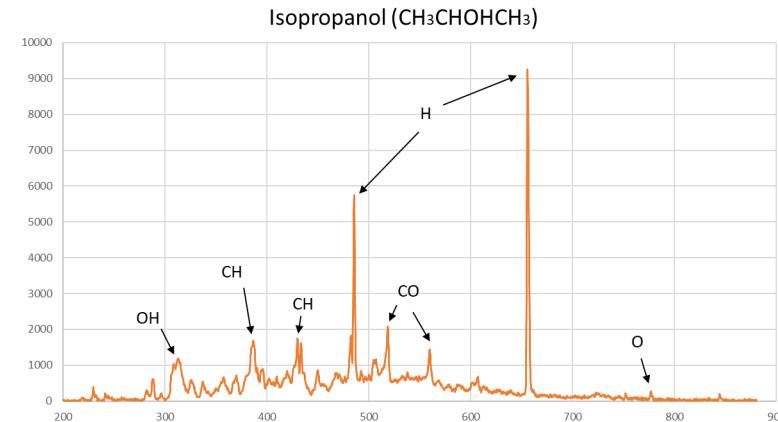
- Example of contactless Pulsed DC surface etching of metallic web via inverted magnetron electrodes
- RF surface etching of oxide coated webs or insulating materials
- Non-magnetic and ferro-magnetic webs (with contact)



# Need a new method to sense gases in vacuum or from atmosphere?

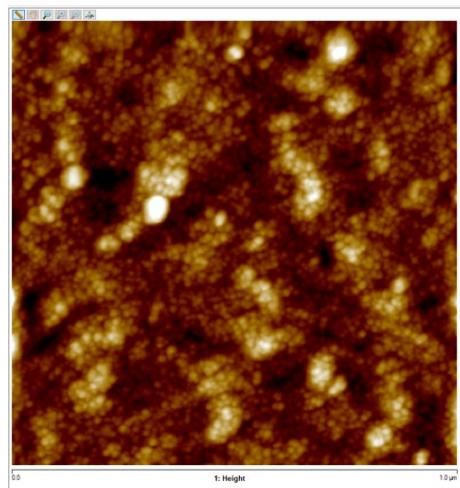
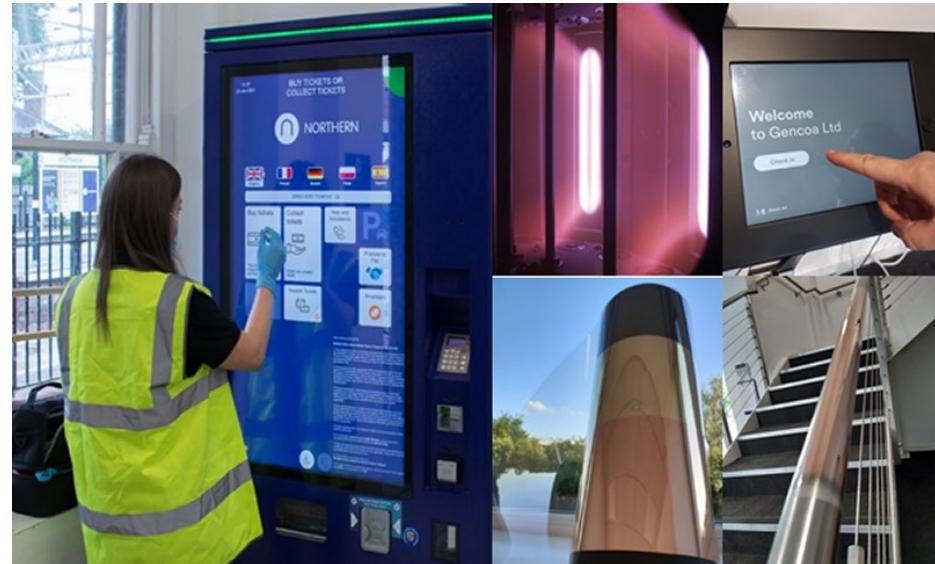
The OPTIX gas sensing device brings Residual Gas Analysis to industrial processes – unique level of operational robustness and tolerance of chemical contamination

- A stand alone device for gas analysis under vacuum
- Can sense from atmospheric pressures with simple rotary vane backing pump
- Vacuum heat-treatment, sintering and hipping
- Fusion reactor studies and control
- Automotive battery pack leak checking
- Pharmaceuticals
- Cannabinoid analysis
- Solvent drying



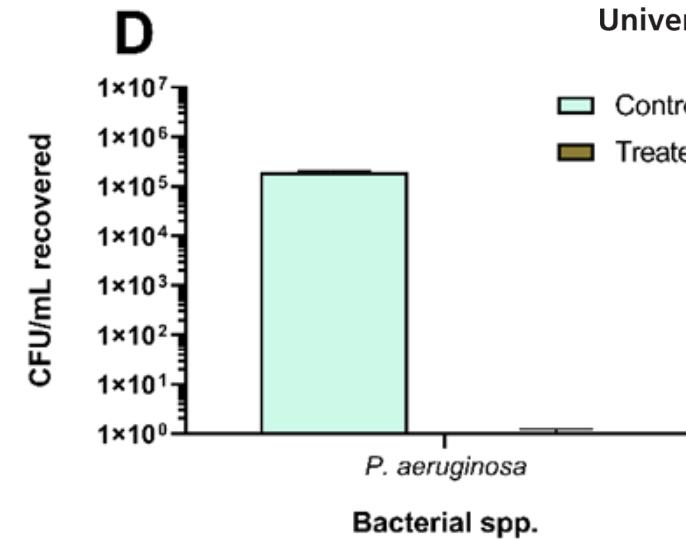
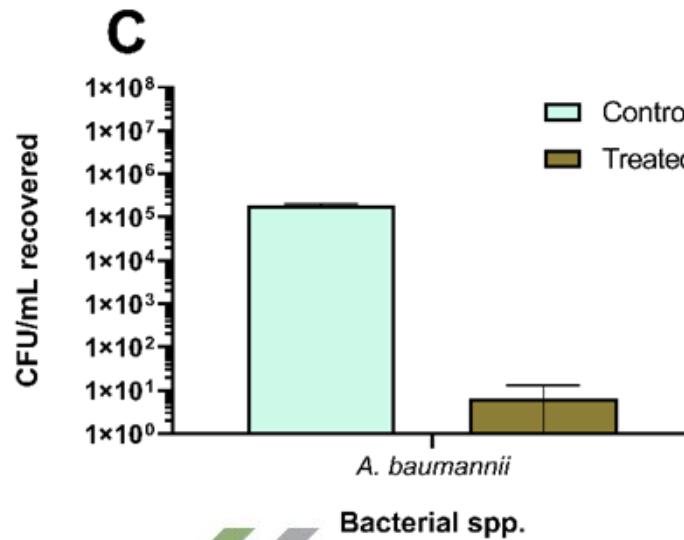
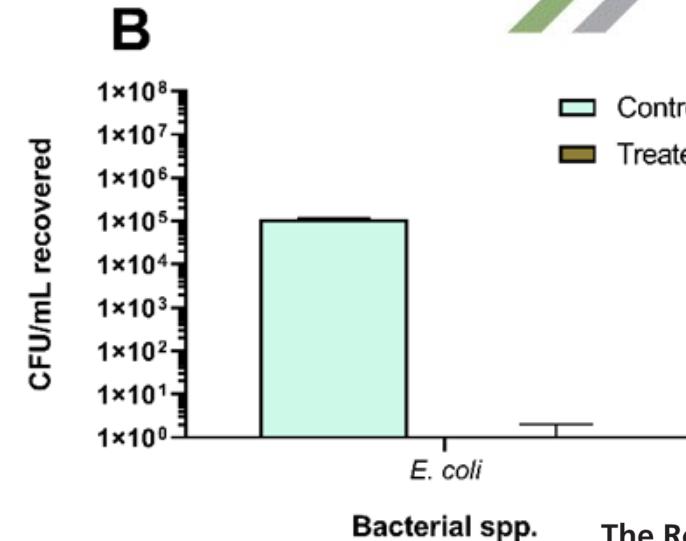
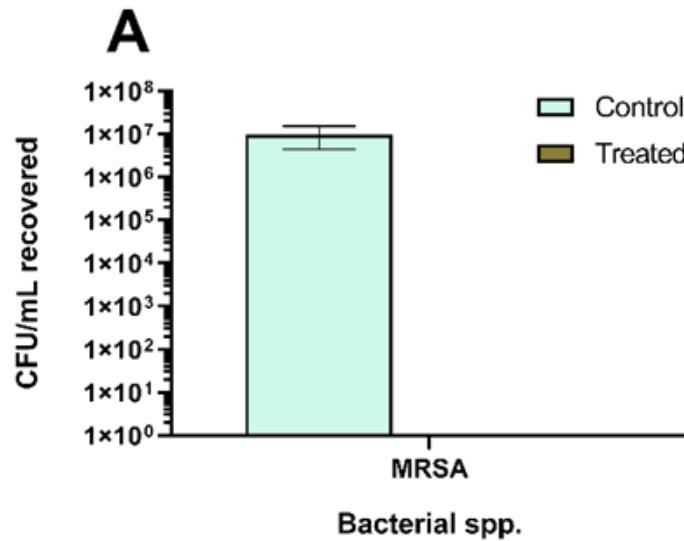


# Need transparent self-sanitizing Gencoа lead the field in production and testing



**Log 6**  
99.9999% kill

# ICN kills >99.999% of surface microbes



iICON  
infection innovation  
consortium

NHS

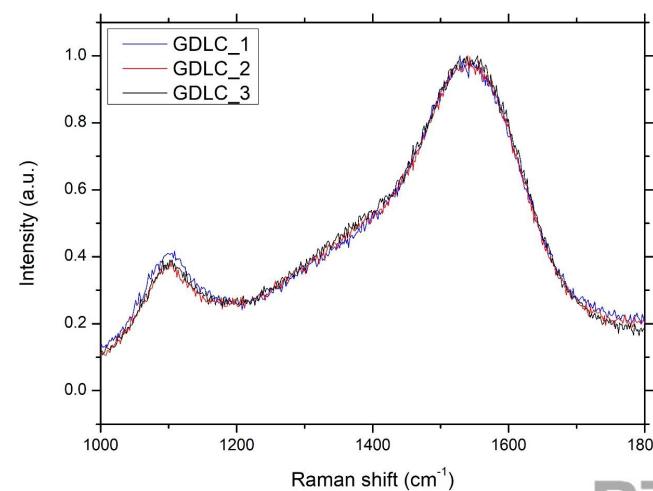
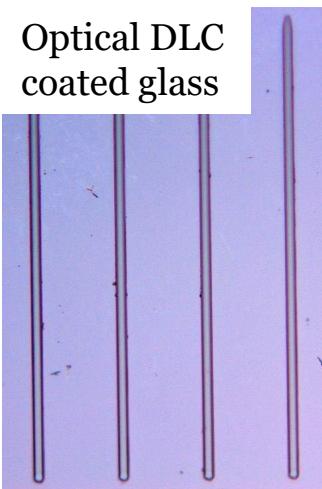
The Royal Liverpool  
and Broadgreen  
University Hospitals  
NHS Trust



LSTM  
LIVERPOOL SCHOOL  
OF TROPICAL MEDICINE

# Need a transparent hard coating? G-DLC Hard Carbon Coating

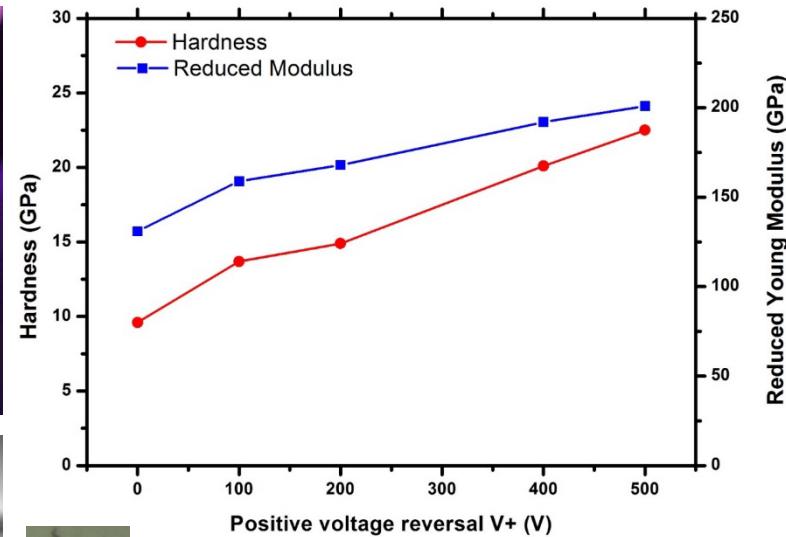
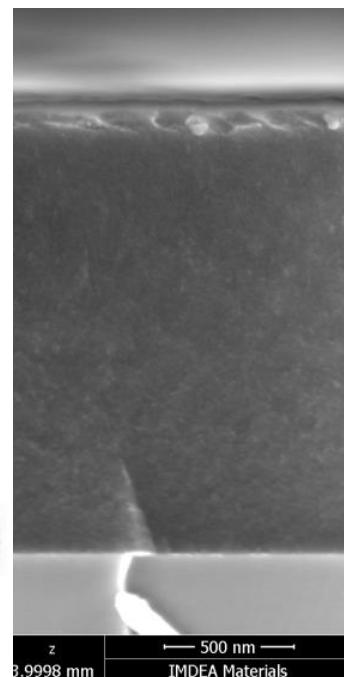
- Gencoа and N4E have developed a transparent hard carbon as a protective overlay for glass and plastic <1% transparency loss in the visible range
- Based upon HipV<sup>+</sup> power, sputtering and active anode technology
- Positive voltage reversal and electron guidance to achieve >35 Gpa hardness, Mohr 9 scratch resistance on glass
- Scalable to any size with process implementation / transfer



# G-DLC

## Hard highly transparent sputtered hard carbon on glass or plastic

The hard carbon deposition method uses a positive pulse reversal combined with electron guiding within the sputter chamber - patent pending.



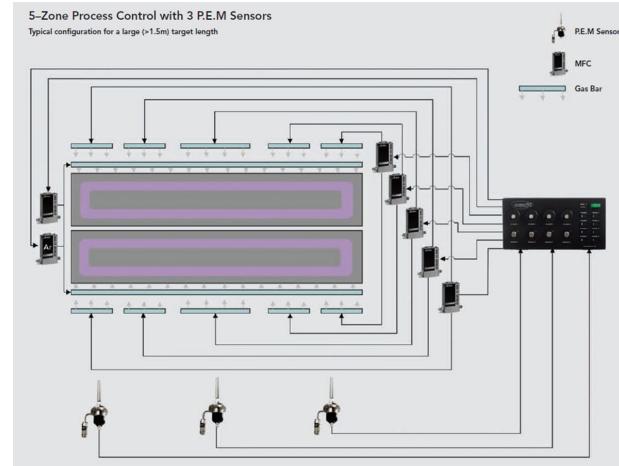
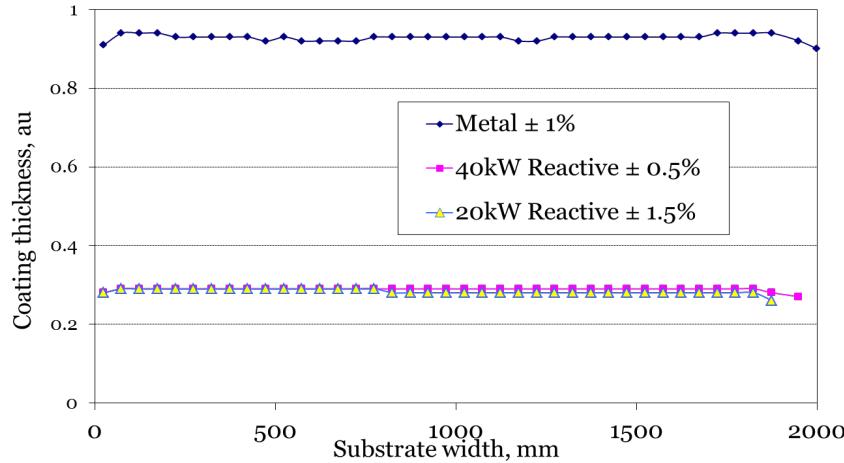
- Critical load: 300 (mN)
  - Very good adhesion-  
 $\text{CO}_2$  plasma pre-clean
  - Delamination failure
  - >8 Mohr hardness for 3nm thick DLC



# Gencoa Process Support provide complete sub-systems and process set-up support world-wide, Pre-delivery plasma tests and qualifications, Remote connection to Speedflo & OPTIX



Uniformity along width of substrate





Gencoа are at the forefront of PVD and  
plasma process technology  
*Supporting customers for 27 years*

