

THIS IS INNOVATION
Compound Semiconductors

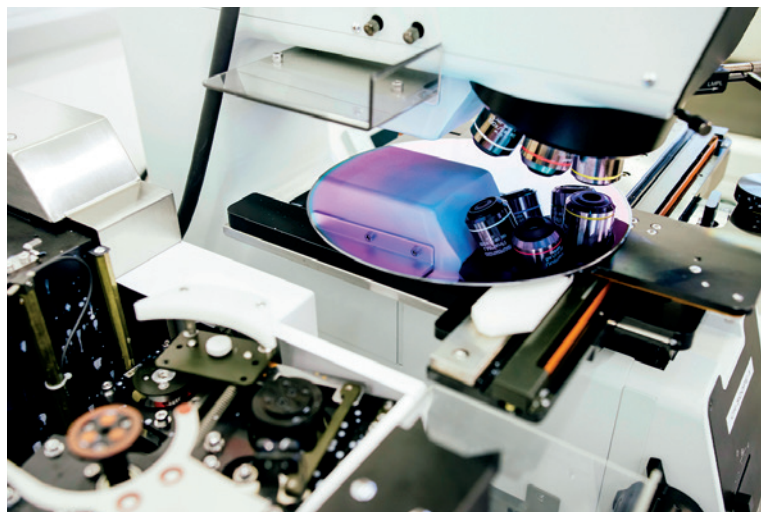


E N A B L I N G



This is a quiet industrial revolution, nudging forward the capabilities of the electronics which hide inside nearly every modern day device and technology. And at their heart, a new generation of enabling materials is opening up endless possibilities.

THIS IS THE FUTURE: COMPOUND SEMICONDUCTORS



Semiconductors are at the core of many of today's technologies. Without them, many devices and applications that we rely on simply wouldn't exist. Yet these atomically engineered materials go largely unnoticed inside the big brands with which we're so familiar.

Silicon is the dependable workhorse, but it has a very basic and limited set of properties. It can't satisfy the needs of emerging technologies that demand ultra-high performance along with sensing and other capabilities.

Compound semiconductors enable high-speed processing that's more than 100 times faster than silicon. They have already complemented silicon in areas such as communications: chips made from material combinations such as gallium and arsenic are found in virtually every smartphone, where they allow high-speed, high-efficiency wireless communications.

Compound semiconductor materials also have the ability to emit and sense light, all the way from the infrared, through the visible and into the ultra-violet spectrum. Their properties can be engineered to provide multi-spectral light tailored to stimulate plant growth. Change the properties again and they offer water sterilisation and treatment.

Big Data is totally reliant on compound semiconductors from the

lasers and detectors which power the internet, through fibre optic broadband, to wireless technology for mobile communications. Compound semiconductors can store, route, transmit and detect data at a fraction of the energy used by current solutions.

The special properties of this material have security uses, too, allowing much more compact and effective radar systems. They're also critical to all battlefield communications, imaging, sensors, night vision, power and electronic warfare systems.

Satellites use compound semiconductors as high-efficiency solar cells and in gyro stabilisers because they are well adapted to the harsh environments in space.

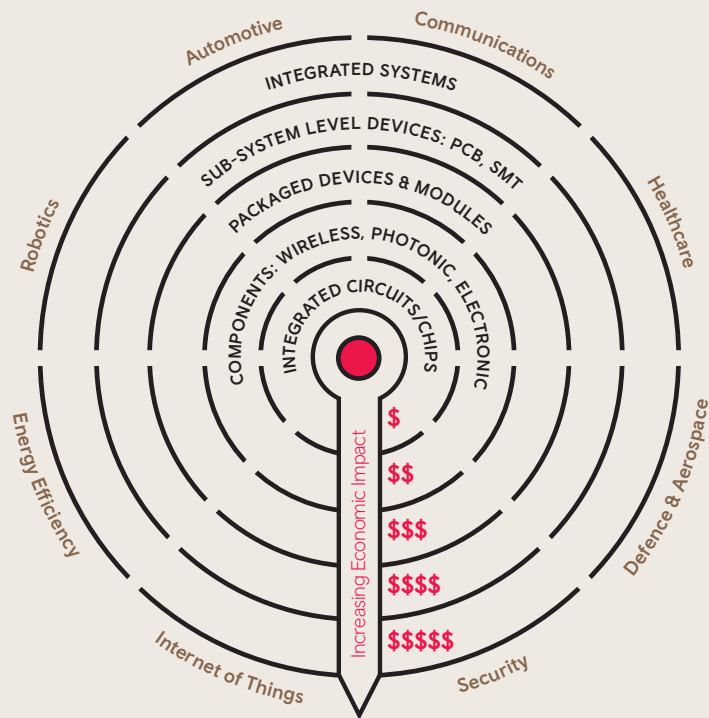
Back on Earth, the technology opens a new world of possibilities. It's already being used for healthcare applications. Driving and autonomous vehicles will be made safer by anti-collision radar and human condition sensing. Then there's 3D sensing and gesture recognition: great for gaming, but combine it with robotics and the possibilities to overcome mobility problems for the elderly are endless.

Silicon changed our world. Compound semiconductors are changing it again, and faster than ever before.

WORLD'S FIRST COMPOUND SEMICONDUCTOR CLUSTER

Collaboration is a powerful tool in accelerating innovation. The benefits are even greater when whole supply chains “cluster” in the same location, breaking down the barriers created by geography and time zones. Silicon Valley in California is a prime example of how the benefit of clustering can propel an industry to a global platform.

The compound semiconductor technology at the heart of the next industrial revolution is coming together in one place – Wales! We have the experts, the specialist kit and the facilities to help integrate tomorrow’s technology into the electronics of any application, from aerospace and healthcare through to robotics, transport and security.



COMPOUND
SEMICONDUCTORS

INFRASTRUCTURE

Compound semiconductors are much more complex than long established Silicon technology. Our highly integrated Wales cluster will guide you from concept to production - whether you're an SME or a global, household name, we'll support you when designing new material through to manufacturing.

Institute for Compound Semiconductor Technology

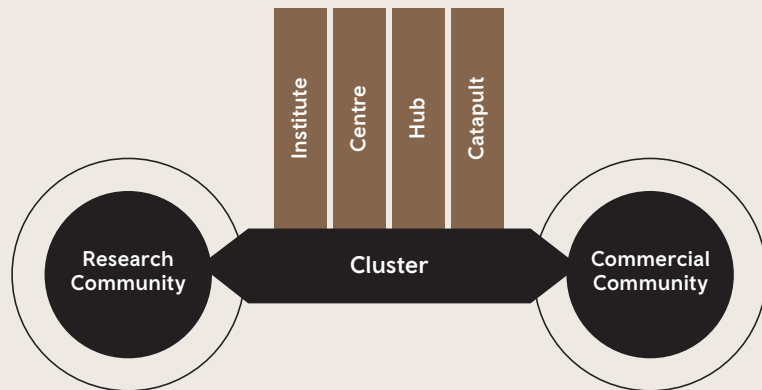
Reaching out from Cardiff University, the Institute will undertake fundamental research on compound semiconductor materials, including making research-scale wafers. It also focuses on the integration of compound semiconductors on silicon and turning them into new devices or subsystems. Finally, it offers device design-for-manufacture services, and near-commercial scale proof of concept production.

It's all complementary – the Catapult, Centre, Institute and Hub will work seamlessly to support the cluster of users further up the supply chain.

Where will you start?

Compound Semiconductor Centre

The Centre operates at the advanced materials end of the supply chain. Its expertise lies in the ability to develop compound semiconductor material combinations. The number of layers and their chemical composition determine the technical performance of the end product. With many years of industrial experience under its belt, the Centre offers the ideal outsource solution, as the cost of ownership of the equipment and know-how to operate it makes this activity prohibitive for most application end users.



Future Compound Semiconductor Manufacturing Hub

Compound semiconductors work alongside silicon technology, but increasingly the manufacture of compound semiconductors on silicon is being explored to exploit the special electronic, magnetic, optical and low-power properties of compound semiconductors, while using the cost and scaling advantage of silicon manufacturing. The Hub will work with organisations which are keen to explore the novel integrated functionality such as sensing, data processing and communication that the new technologies bring.

Compound Semiconductor Applications Catapult

If you are a systems integrator or developing your own applications, the Catapult is a great place to start. It will translate your technical requirements into the specification to create a new compound semiconductor tailored to your exact needs. This could include integrating photonics with electronics, designing devices for manufacture, or enhancing their robustness.

W E L S H I N D U S T R Y S T R E N G T H S

Microsemi Corporation – advanced packaging

Microsemi is focused on providing solutions where power matters, security is non-negotiable and reliability is vital. Microsemi's advanced packaging business based in South Wales designs and manufactures miniaturised semiconductor (silicon and compound) modules for high reliability, harsh environments such as data centres, medical implants and aerospace applications. The business has developed novel module packaging, embedded component technology and wafer scale assembly processes to meet growing needs around complex miniaturised solutions.

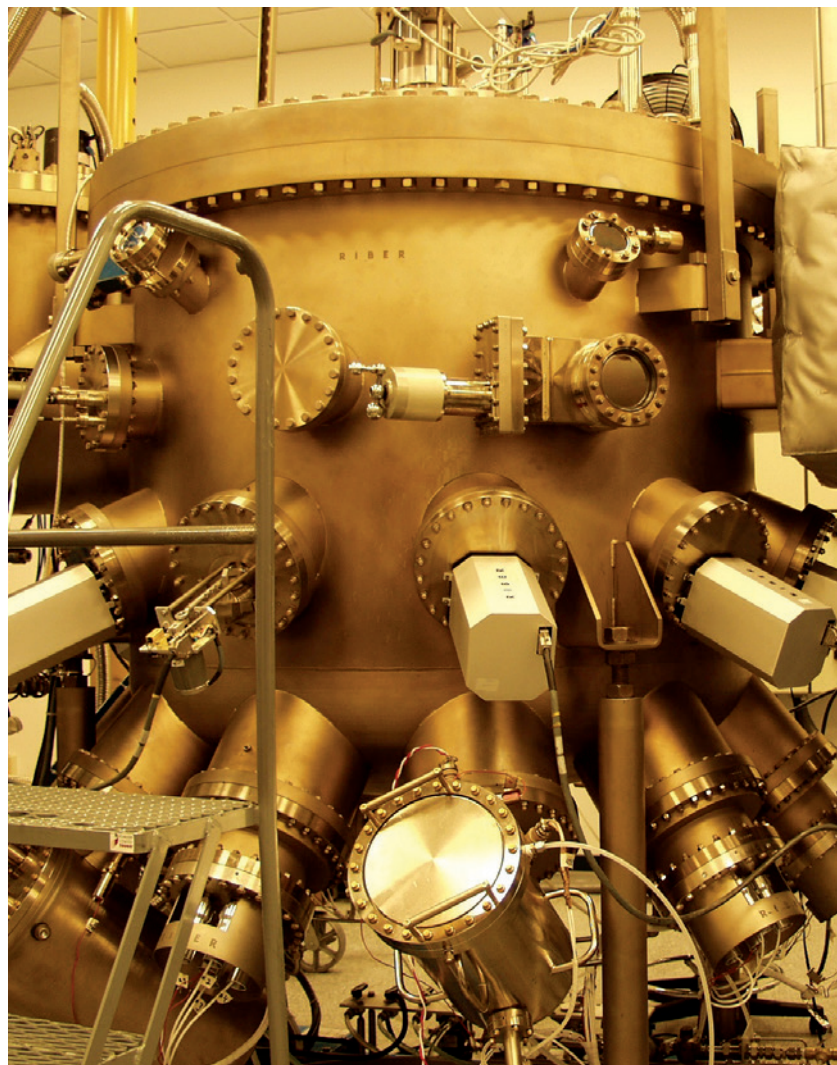
IQE plc – a wafer foundry

IQE was the world's first dedicated, outsourced compound semiconductor wafer foundry when it set up in 1988. Headquartered in Wales, the compound semiconductor wafers it produces are used by major global chip companies in

applications including wireless comms, advanced solar power and high-efficiency LED lighting. The wafers are made in high-spec clean rooms, using sophisticated production tools and extensive intellectual property. Their customers make a wide variety of devices and systems from IQE's wafers.

SPTS Technologies – specialist wafer processing equipment

SPTS Technologies, an Orbotech company, designs and manufactures advanced wafer processing equipment used by the global semiconductor industry to manufacture integrated circuits. Its equipment enables manufacturers to deposit material with high uniformity onto the surface of a wafer, to etch material selectively and efficiently, and dice the wafer to create advanced electronic devices. Typical applications include MEMS (micro electro mechanical systems), advanced packaging, power semiconductors and LEDs.



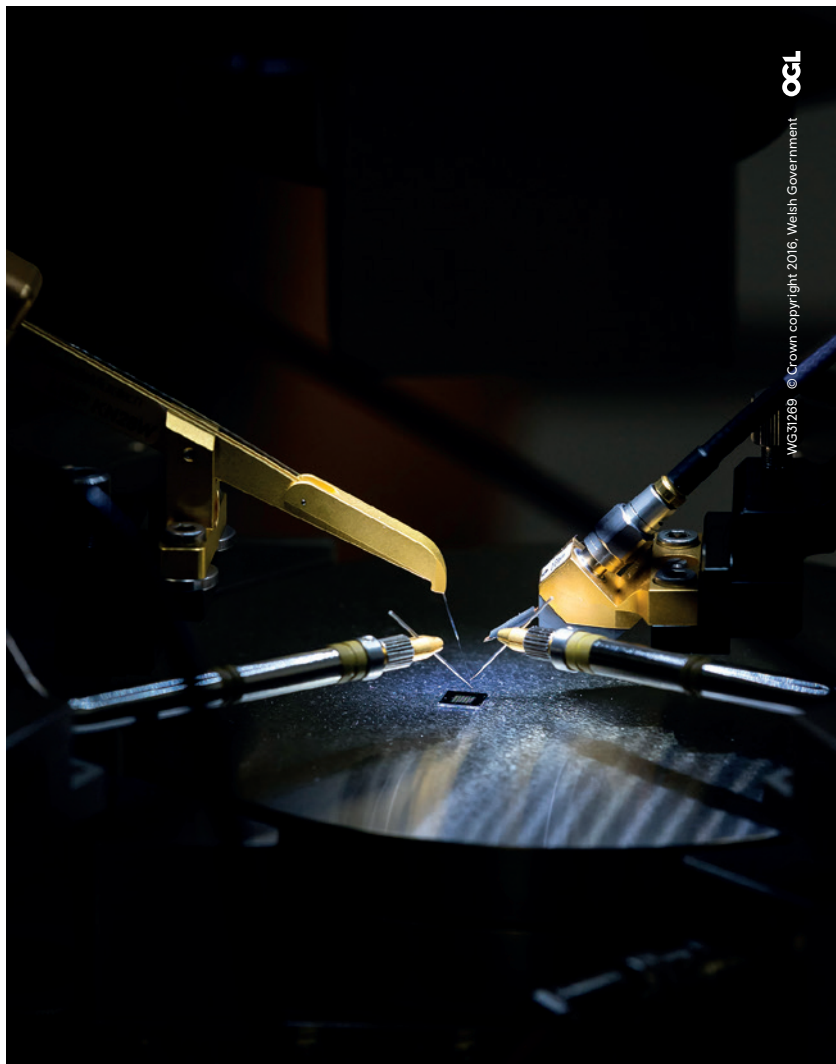
WHAT NEXT?

Do your products need ultra-high performance electronics and do you want to be part of this exciting cluster?

Find out what Wales can do for your business:

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tradeandinvest.wales

Images: Cardiff University, IQE
and photographer, Patrick Olnier,
Tall and Short Photography





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