Newsletter

September 2025

Compound Semiconductor Manufacturing Hub for a Sustainable Future

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South Wales Compound Semiconductor Place Based Impact Acceleration Account

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Skills: Building Capacity and Capability

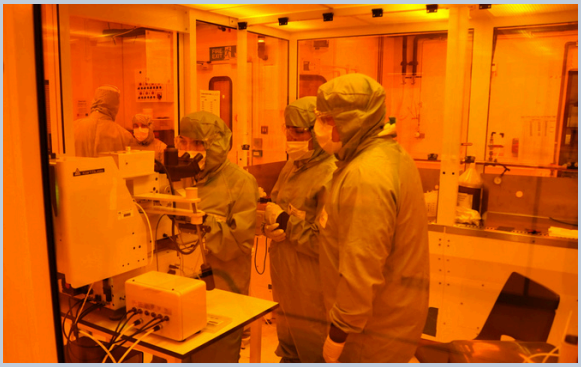
One of the key roles of the EPSRC Place Based Impact Accelerator Account (PBIAA) is to address the significant skills shortage for the rapidly expanding compound semiconductor industry. PBIAA has developed a week-long intensive training programme, designed and developed by the Institute for Compound Semiconductors (ICS), and recently delivered to engineering professionals from Semtech Corp, based in Bristol. The training programme utilised academic expertise from the CS cluster alongside local research infrastructure (Cardiff University's Queen's Training Cleanroom) to provide a combination of theory and practical training.

The training programme promoted the following outcomes:

- Understanding of the steps involved in fabricating an electronic semiconductor device;
- Knowledge of CS design, nanofabrication, and testing;
- Experience of the technologies and techniques used in fabricating a CS device;
- Knowledge of essential skills needed for working safely in cleanroom environments; and
- Practical exposure to semiconductor device processing.

Reflecting on the training undertaken, the staff who participated commented:

"The PBIAA skills course has helped me learn a lot about semiconductor processing, particularly relative to the III-V compound semiconductors, used often at Semtech. We looked principally at the etching and depositing processes, alongside the different issues/challenges encountered. The course has been incredibly useful to my professional development as I have re-learned processes, studied a long time ago at the start of my career, whilst also introducing me to new processes which I will need to consider in future."



"My favourite part was operating the plasma etchers to etch patterns and sequels on the final wafers and seeing the process close up to fully understand how it worked. The course has broadened my knowledge and enhanced my understanding of the semiconductor processes, different to the silicon processes with which I am more accustomed. I'd recommend this training to anyone in or outside of the industry, especially graduate engineers who may not have been exposed to world of compound semiconductors."

Further training courses are being rolled out according to partner requirements and include upcoming courses on Gallium Arsenide (GaAs) and also in crystal growth. PBIAA is currently offering training support to those cluster companies that are expanding so rapidly that it is challenging for them to meet their staff's training needs and demands all by themselves.
Please contact us for more information and to see how we might help YOU!

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Funded places on semiconductor short courses

fully supported by the EPSRC-funded South Wales Compound Semiconductor Place Based Impact Acceleration Account (SWCS PBIAA), funding is availble for the below courses. The course are suitable for upskilling staff already working in the semiconductor industry, reskilling people joining the sector (or considering it) and supports companies investing in skills in the CSconnected region

Introduction to etching for semiconductor manufacturing (in-person)
Gain a theoretical understanding of wet and dry etching.

Cleanroom protocols (online)
What it's like to work in a cleanroom environment, including working practices

Introduction to compound semiconductor photonics (online)
An overview of CS photonics and its practical applications.

Introduction to compound semiconductor electronics: part 2 (in-person)
An in-person, practical workshop that builds on the content of the online course.

Introduction to compound semiconductor electronics: part 1 (online)
An overview of CS electronics and its practical applications.

You can qualify for a fully funded place on these courses if you are 18 or older and either live or work in the Cardiff Capital Region or the Swansea Bay City Deal Region.*

*The ten local authorities in the Cardiff Capital Region are Cardiff, Caerphilly, Newport, Vale of Glamorgan, Bridgend, Rhondda Cynon Taff, Merthyr Tydfil, Blaenau Gwent, Torfaen, and Monmouthshire. The four local authorities in the Swansea Bay City Deal Region are Swansea, Neath Port Talbot, Carmarthenshire, and Pembrokeshire.

For more information, please click here

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European Conference on Integrated Optics, 2025

The CS hub proudly hosted the three day European Conference on Integrated Optics,(ECIO) in Cardiff. This successful event brought together delegates from academia and industry across the world for discussions on cutting-edge research in integrated optics, optoelectronics, and nano-photonics, while also showcasing their products and services. Plenary speakers included: Bart Kuyken, Gent University / IMEC, Belgium; Donguk Nam, Korea Advanced Institute of Science and Technology KAIST, Korea; Benjamin Eggleton, University of Sydney, Australia; Roel Baets, Gent University, Belgium; Leonardo Midolo, Niels Bohr Institute, University of Copenhagen, Denmark and Pieter Wuytens, LIGENTEC SA, Switzerland

This year, the dominant theme at ECIO was heterogeneous integration, which has become a major driver for combining active and passive functionality on a chip, alongside the established growth-based techniques. Another clear trend was the continued development of quantum photonic integrated circuits, with novel ideas emerging especially in single photon sources. Various realisations of photonic processors were also being discussed, with both the quantum and neural network- based architectures addressing the long-held vision of an “optical computer”.

ICS : 10 years old

July 2025 marked 10 years since Cardiff University Council formally gave the go ahead for the establishment of a "Research Institute for Compound Semiconductor Technology" with the aim of creating a "world class centre of excellence for the commercial and academic exploitation of Compound Semiconductor Technologies.
Read the full story here

PBIAA Collaborative Funding Pot

The PBIAA Collaborative Funding Pot leverages early-stage commercialisation and academic entrepreneurship, facilitating company formation in the South Wales region. Funded proposals collaborate with and use facilities at the ICS, CISM and any other cluster entity to innovate and set up in the region. All award recipients have the opportunity to attend a suite of research and commercialisation activities delivered by SETsquared, including webinars, 1:1 training, equity finance workshops, iCURE programme access, and CR&D bid development sessions. The SWCS PBIAA has funded 10 – out of a target of 15 – commercialisation and company formation projects to date, supporting an array of academics across UK universities at all career stages. Past and current award holders include:

Round 1
Dr Sam Bishop (Cardiff)
Dr Fabien Massabuau (Strathclyde)
Profession Vincent Barrioz (Northumbria)

Round 2
Professor Martin Cryan (Bristol)
Dr Sam Shutts (Cardiff)
Dr Vishal Shah (Warwick)
Dr Saptarsi Ghosh (Swansea)

Round 3
Professor Anthony Bennett (Cardiff)
Dr Mengxun Bai (UCL)
Dr Gregory Burwell (Swansea)

The fourth and final Funding Call, to support another 5 proposals, has been launched. Please contact PBIAA Programme Manager Dr Rachel Morgan for more information and eligibility criteria or click here.

Congratulations to CS Hub Professor Lenny Koh, who has been successful on a new UKRI funded project - IGNITE manufacturing. IGNITE will transform the UK's steel industry supply chain, enhancing both the physical infrastructure and national security. The new hub will explore how cutting-edge university research can accelerate industrial decarbonisation in the UK manufacturing industry. The primary goal is to deliver strategic, environmental, and economic resilience for key strategic areas of the UK manufacturing economy, including defence, transport, and energy.

Conferences

Members of the CS hub have recently presented at the following conferences:

- Semiconductor and Integrated Opto-Electronics conference (SIOE)
- European Conference on Integrated Optics (ECIO)
- CLEO-Europe Munich
- UK Semiconductor

At UK Semiconductor there were 22 presentations from Hub staff and related students including a plenary by Prof Anthony Bennett, 'Colour Centres in Wide-Bandgap Semiconductors' and other talks such as :

- Low threshold InAs/InP quantum dot lasers grown by MOCVD, Zhao Yan, S. Liu B.-P. Ratiu, K. M. Wong, H. Zeng, Y. Wang, J.-S. Park, H. Liu, P. M. Smowton, Q. Li
- Comparison of MOCVD-grown C-band InAs/InAlGaAs quantum dot and quantum well laterally coupled distributed feedback Lasers, Tom Simpson, B. Salmond, T. Peach, S. Liu, W. Meredith, Q. Li P. M. Smowton S. Shutts
- Influence of Epitaxial Process Variations on the Optical Gain of InAs Quantum Dots Grown on InP (100) via MOCVD, Zhongming Cao, C. Hentschel, B. Salmond, Q. Li, S. Shutts, P. M, Smowton

CS Hub will be presenting at a number of upcoming international conferences including:
the 2025 edition of the European Semiconductor Laser Workshop at the Technical University of Denmark (DTU) from Friday, October 3, to Saturday, October 4, 2025.
The IEEE International Photonics Conference (IPC) 2025
9-13 November, 2025, Singapore
and Photonics West 2026, 17-22 January 2026 San Francisco

Please come and say hello!

CS Hub Professor Lenny Koh will be speaking at a Semiconductor Industry workshop at the Royal Society London on the 18th of September. The meeting will be centred on the following areas of sustainable electronics:

- Semiconductor materials and design – new design strategies for sustainability, and designing for repair and recycling
- Lifecycle assessment - sustainability reporting and the use of the new Digital Product Passports
- Electronics in applications – addressing sustainability challenges in real-world electronic applications
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Click here for registration

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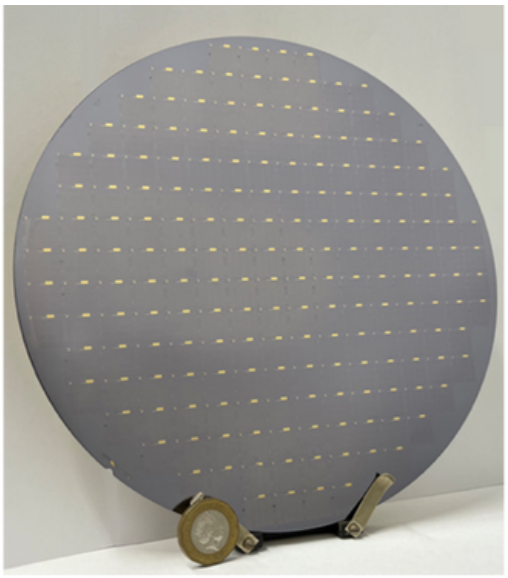
'Engineered Porous Wafers for Scalable Substrate Reuse, Mass Transfer and Chip Fabrication in microLED Manufacturing'

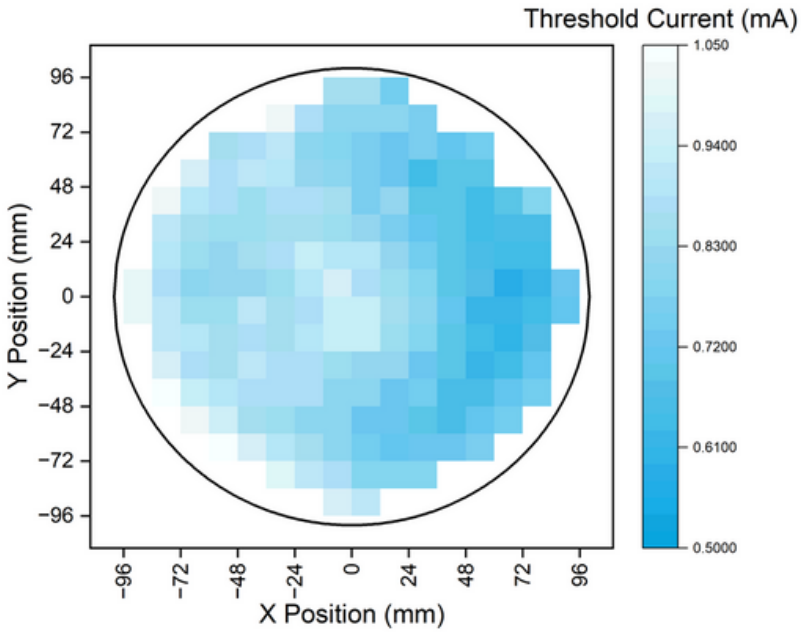
Congratulations also to CS Hub's Prof Peter Smowton, the Cardiff PI, and Dr Yingjun Liu of CS Hub partner Poro Technologies Ltd, who, together with the University of Bournemouth, have recently been awarded a 'Developing Semiconductor Hardware For Critical Technologies' project. The Innovate UK project will help create impact from CS Hub initial research, combined with partner expertise at Poro Technologies and the University of Bournemouth. Such work is critical in driving environmental sustainability as well as cost effective mass manufacturing for the CS industry.

CS International Conference

CS Hub's Professor Peter Smowton will speak at the **CS International** conference detailing the CS Hub's recent progress on the manufacturing processes for Vertical Cavity Surface Emitting lasers on 150 and 200mm substrates.



Fabricated 200 mm (8") VCSEL wafer.



Find out more about selected CS Hub Publications

Gillgrass, S. J., Baker, J., Allford, C. P., Davies, J. I., Shutts, S. and Smowton, P. M. 2025. AlGaAs VCSELs grown on thin 150 mm germanium substrates. JPhys: Photonics 7(3), article number: 35033. (10.1088/2515-7647/adef1f)

To reduce material usage and minimise device cost the use of reduced substrate thickness is considered in high volume vertical-cavity surface-emitting laser (VCSEL) manufacturing. For large-diameter VCSEL wafers, germanium (Ge) is emerging as an alternative substrate solution. In this work, VCSEL structures designed for 940 nm emission are grown by metal–organic vapour-phase epitaxy on 150 mm (6 inch) germanium substrates of thickness 675, 450 and 225 µm. Using on-wafer testing of fabricated devices, threshold current density, differential resistance, and emission wavelength are compared across the three substrate thicknesses, with results demonstrated for the first time on a Ge wafer thickness of 225 µm. These results underline the potential of thin Ge substrates for reduced material usage in VCSEL manufacturing.

Yan, Z. et al. 2025. MOCVD-grown InAs/InP quantum dot lasers with low threshold current. Optics Express 33(15), pp. 31195-31203. (10.1364/OE.568365)

In this work, we have demonstrated low-threshold-current and high-yield InAs/InP QD lasers grown by MOCVD. Deep-etched ridge waveguide lasers were fabricated with a narrow 4 µm ridge width and top–top metal contact configuration. The devices achieved threshold currents of 17 mA for 300 µm cavity length and 28 mA for 1000 µm cavity length. Lasing operation was maintained up to 120 °C. These results confirm the potential of MOCVD-grown InAs/InP QD lasers as light sources for the C- and L-band applications and for future integration on silicon platforms.

CHIMES 2

The University of Southampton, together with the University of Sheffield, are set to receive £12.5m of government funding for a new centre to help design the next generation of electrical systems.

The Centre for Heterogeneous Integrated MicroElectronic and Semiconductor Systems (CHIMES 2) will address the challenge of interconnecting semiconductors – microtechnology powering everyday electrical items – as they become increasingly smaller with advances in design.

Culture and Community

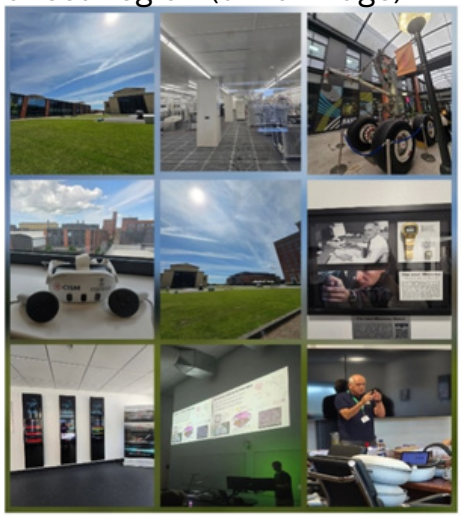
To help increase awareness of the CS ecosystem and appetite to engage in the ecosystem, SWCS PBIAA and CS Hub have held and taken part in multiple events and meetings that were open to members of the general public. Consistent engagement in "regular drum-beat events" was highlighted as a key strategy to grow and gather momentum in increasing engagement in the CS ecosystem. SWCS PBIAA and the CS Hub have delivered a series of networking, public engagement and outreach events over the last year, engaging academic and industry partners and demystifying the world of compound semiconductors to students of all ages. Some notable events include:

- TeenTech Cardiff (December 2024) where PBIAA, ICS, CSconnected and CISM ran a collaborative exhibition stand. Please see the event video here:

- ·Cardiff Science Festival: Be A Scientist (February 2025), where PBIAA, ICS, CS Hub, CDT and CSACatapult delivered an array of exciting activities. A big thank you to our CDT students (in the first image below), who helped man the stand demonstrate virtual reality headsets and engage audiences of all ages!

- Exhibiting at the Semiconductor Integrated Opto-Electronics (SIOE) and networking at Cardiff Castle (second image)

- Schools Outreach at CISM, where PBIAA and staff from Engineering, Chemistry and Physics welcomed primary and secondary schools from across the Swansea region (third image).



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UK's discovery of new semiconductor materials to be revolutionised by University of Sheffield

New AI-driven equipment will transform the UK's semiconductor R&D. The University of Sheffield has won a £7 million investment to fund new equipment that will revolutionise the discovery and development of new semiconductor materials. The Molecular Beam Epitaxy (MBE) system will utilise AI to accelerate the discovery and development of new semiconductor materials

Funded by the Engineering and Physical Sciences Council (EPRSC), the system will be equipped with the very latest innovations, including state-of-the-art data collection tools, that will help position the UK as an international leader in semiconductor development.

The equipment will be configured to provide new avenues for research in unique material combinations, such as the mixing of semiconductors and superconductors to create brand new device concepts. The need to increase environmental sustainability in the semiconductor industry by seeking out new semiconductors made from earth-abundant materials such as Zinc, Aluminium and Nitrogen – the new equipment in Sheffield will pioneer this field

Project PROPEL

Congratulations to CS Hub's Dr Sam Shutts, the Cardiff PI, who has recently been awarded Project PROPEL. Over the next 18 months, the PROPEL team will co-develop a novel photonic integrated circuit (PIC) featuring a widely tunable, ultra-narrow linewidth laser (<50 kHz) operating at a central wavelength of 1 µm. The device will be optimized for non-invasive personal health monitoring applications, targeting physiological parameters such as heart rate, oxygen saturation, and hydration levels.

The team bring their expertise in ultra-narrow linewidth tunable lasers, as compact and highly stable sources meet the stringent requirements for health monitoring applications. The technology and expertise will help achieving TRL 7/8, aiming to demonstrate a compact, energy-efficient, and field-ready solution capable of operating in variable environmental conditions.

PROPEL represents a strategic collaboration between the CSconnected, the world's first compound semiconductor cluster in South Wales and the PhotonDelta ecosystem in the Netherlands, with support from East Netherlands Development Agency (Oost NL). The project aligns with broader European industrial transformation goals, via the Vanguard Initiative (VInnovate), particularly under the Nano /Microsystems and High-Tech Materials Pilot and the VI Smart Health Pilot.