December 2020

CS HUB NEWSLETTER

Engineering and Physical Sciences Research Council

CS Hub

Welcome to our new newsletter!

It has been a while since our last newsletter and given the challenges COVID has presented, we are keen to communicate with our industry and academic partners.

We will be circulating our newsletter every 6 months, sharing key Hub news and developments, and focusing on specific Hub research addressing long-term CS challenges.

As the Hub moves beyond the halfway stage of our 7-year research programme, we continue to work with over 30 industry partners and over 10 academic institutions to shape and drive forward our research.

Through this newsletter, our website and Twitter feed, and Hub events we will continue to update you on the Hub's progress and encourage you to contact us to discuss the Hub's research and any opportunities for collaboration.

SIOE Conference 2021

The Semiconductor and Integrated Opto-Electronics (SIOE) Conference will take place from the 30th March to 1st April 2021. This year's conference will be online, and we hope this will provide an opportunity for new areas of engagement. We will share more information and the agenda for the conference over the coming weeks.

Round 3 of Feasibility Studies Begin

The Hub funded 4 new feasibility studies, as part of a joint call with the Metrology, Photonics and Composites Manufacturing Hubs, with the 6-month studies starting in April 2020. Studies are being led by Bath, Cardiff (with Huddersfield and UCL), Sheffield, Strathclyde and Warwick Universities and further information on the studies and the research of the Hub can be found on our website.

National Epitaxy Facility Statement of Need

Members of the CS Hub recently joined academics from across the UK and took part in engaging discussions as part of the National Epitaxy Facility Statement of Need Community Consultation meeting. The Hub looks forward to engaging with the next steps of the process.

Hub skills and research surveys

The Hub has developed surveys to better understand the skills and recruitment needs CS manufacturing employers and to understand the areas of CS research that are of most interest to our industry partners. We would be grateful if you could take a few minutes to complete the skills and research surveys to help us with this.

Stay in Touch

All our latest news is available on our website:
compoundsemiconductorhub.org

Follow us on Twitter: @FutureCSHub

The University Of Sheffield.

MANCHESTER 1824 The University of Manchester

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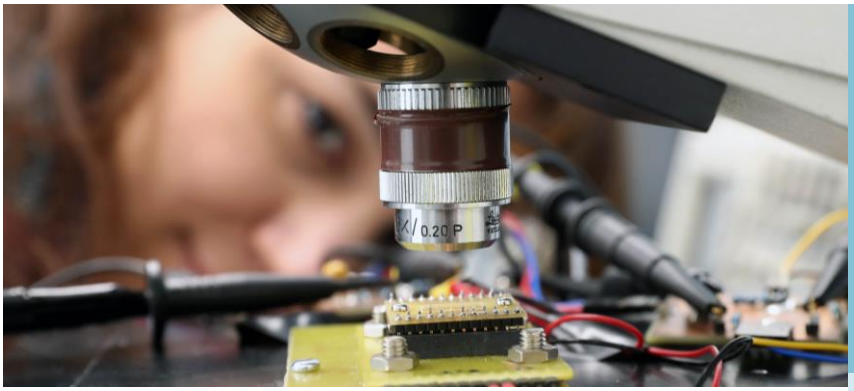

In Focus: Work Package 4

Research Summary

Recently, researchers from UCL and Cardiff University have demonstrated high performance telecommunication wavelength III-V semiconductor lasers monolithically grown on Si substrate for Si for realising a highly efficient on-chip light source in Si photonics. The results are published in *Advanced Optical Materials, Optics Letter, Journal of Physics D: Applied Physics, Journal of Selected Topics in Quantum Electronics*. The work covers material specification to industrial level device characterization and has significantly pushed forward the commercialisation of Si-based on-chip light source.

Progress and challenges to date

Inversion boundary, or so-called antiphase boundary, is a type of defect due to the polar on non-polar epitaxial growth, which makes it almost impossible to produce high-quality III-V devices on Si platform. The conventional method to solve this fundamental issue is using MOCVD system to fabricate bi-atomic Si steps, however, it is not compatible for MBE system and the fabrication of high performance QD laser.

Researchers demonstrated a novel technique by growing periodic straight and meandering single atomic steps to successfully confine the IB's propagation by only using MBE system. This result leads to the demonstration of high operating temperature QD laser based on Si platform.

"Our method of creating an APB-free GaAs/Si platform has solved the fundamental problem of high performance and CMOS-compatible Si-based on-chip light source by using molecular beam epitaxy system. This work has made all MBE-grown quantum dot laser on Si is highly viable solution for Si photonics"

Lead: Dr Mingchu Tang

Publication Spotlight

The papers listed below are some highlighted publications from recent months:

Preferred growth direction of III–V nanowires on differently oriented Si substrates Haotian Zeng *et al* 2020 *Nanotechnology* **31** 475708; DOI: 10.1088/1361-6528/abafd7

All-MBE grown InAs/GaAs quantum dot lasers with thin Ge buffer layer on Si substrates Junjie Yang *et al* 2021 *J. Phys. D: Appl. Phys.* **54** 035103; DOI: 10.1088/1361-6463/abbb49

Monolithic InP Quantum Dot Mode-Locked Lasers Emitting at 730 nm Zhibo Li *et al* 2020 *IEEE Photonics Technology Letters* **32** 1-1 DOI: 10.1109/LPT.2020.3012568

Influence of micro-patterning of the growth template on defect reduction and optical properties of non-polar (1120) GaN Jochen Bruckbauer *et al* 2021 *J. Phys. D: Appl. Phys.* **54** 025107; DOI: 10.1088/1361-6463/abbc37