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TechARENA: Photonics

AIM Photonics – Manufacturing Challenges for Photonic Integrated Circuits

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Abstract
Abstract: The American Institute for Manufacturing Photonics (AIM Photonics) is a manufacturing consortium headquartered in NY, with funding from the US Department of Defense, New York State, California and Massachusetts, and industrial partners to advance the state of the art in the design, manufacture, testing, assembly, and packaging of integrated photonic devices.
The institute has focused its 1st year activities on providing a turn-key capability to industrial customers with a primary focus on SMEs, university researchers and government agencies. To that effect, a multi-project wafer (MPW) offering was established including a service broker, a Process Design Kit (PDK) and a suite of component library elements. The design component strategically support the migration from a full custom design environment to a hierarchical methodology expected to provide significant productivity enhancements.
Using NY State funding, AIM Photonics is establishing a Test, Assembly and Packaging (TAP) facility that complements its leading-edge silicon photonics wafer capability. The TAP facility is expected to open in 3Q2017 and be fully operational early 2018.
We have established AIM Academy, an organization under the institute that fosters education. A key tenet for AIM Photonics is to develop and ensure a well-trained workforce through the AIM Photonics Academy. This effort is designed to provide a unified learning, training, knowledge, technology and workforce deployment platform. Lastly, we have merged with the prior integrated photonics road mapping activity and have published two yearly updates to the roadmap which are publicly available.

Biografie

Michael Liehr is the Chief Executive Officer of the American Institute for Manufacturing (AIM) Photonics. Michael focuses on the creation of new AIM business opportunities, and is responsible for the effective and efficient operation of AIM's programs including SUNY Poly's strategic 300mm integrated photonic semiconductor and 3D packaging. He is also SUNY Polytechnic Institute's Vice President for Research and Executive Vice President for Technology and Innovation. Prior to this assignment, he led the Global 450mm Consortium through the start-up phase as the General Manager and was an IBM Distinguished Engineer.

Recent progress in MOCVD Technology for Electronic and Optoelectronic Devices

M. Heuken
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AIXTRON, Innovation, Herzogenrath, Germany

Abstract
Solid State Lighting (SSL) based on LED, solar energy harvesting and low loss energy saving power conversion based on AlGaInN/GaN electronic devices require advanced, high yield and high throughput MOCVD production technology. To further improve the cost-of-ownership and to allow semiconductor photonic devices market penetration eg for SSL or sensing applications the proven multiwafer Planetary Reactor® as well as the Showerhead reactor family was recently upgraded and automation was added. Simulation of temperature distribution and gas flow allows understanding the growth process as well as limiting technological factors thus contributing to productivity increase.
Revolutionary as well as evolutionary steps have led to the introduction of the AIX G5 HT and high productivity Close Coupled Showerhead (CCS) reactors. Both exhibit high wafer capacity configurations with multiple wafer of various size up to 5x200mm for AIX G5+, and 31x4” for showerhead reactors. The basic design rules and principles of MOCVD growth optimization including productivity increase and details of today’s high brightness LED and HEMT technology on Silicon and PSS substrates will be explained. The resulting uniformity data within the 1 % range on 200 mm Si wafer enables state of the art production.
The Cost of Ownership (CoO) of MOCVD tools is mainly determined by wafer yield and by reduction of user interaction due to automation. This paper discusses the different developments in the field of MOCVD to facilitate further reduction in production cost and simultaneously improving the device characteristics.

Biografie
Prof. Dr. Michael Heuken was born in Oberhausen, Germany on November 17, 1961. He received the Diplom Ingenieur degree and the Dr. Ing. degree in Electrical Engineering from Duisburg University in 1985 and 1989, respectively. He joined the “Institut für Halbleitertechnik” at RWTH Aachen as senior engineer and has been working in the field of metalorganic vapor phase epitaxy for electronic and optoelectronic devices. In 1994 he finished his Habilitation in semiconductor technology and devices with a thesis on optoelectronic devices. Since then and still at present he has been lecturer for semiconductor technology and devices as well as circuits for communication systems. Prof. Dr. Michael Heuken joined AIXTRON in 1997 in Aachen-Germany where he is now Vice President Corporate Research and Development. His main research interests are in the fields of semiconductor growth by MOVPE, materials characterization, device technology, electronic and optoelectronic devices and circuits. Prof. Heuken is author and co-author of more than 650 publications in international journals and several invited papers at international conferences. He was President of DGKK (German Crystal Growth Association) from 2002 to 2005. He is elected councilor of IOCG (International Organization of Crystal Growth) representing Germany. He is member of VDE/ITG and was board member of OptechNet e.V. and EPIC (European Photonic Industry Consortium). He has been granted several patents in the field of MOVPE technology.

Enabling integrated active photonics with transfer printing

B. Corbett
Group Leader
Tyndall National Institute, Cork, Ireland

Abstract
The talk discusses the emergence of silicon photonics as a scalable high performance platform for photonic integration enabling applications in communications and sensing. This platform needs III-V materials and devices to achieve its full potential. We show that transfer printing can address this problem with examples from the EU-TOPHIT project, the Irish Photonics Integration Centre and from X-Celeprint.

Biografie
Brian Corbett is leading the III-V materials and devices group at Tyndall, University College Cork Ireland. He received degrees in Physics and in Mathematics from Trinity College Dublin. His research is in the physics and technology of III-V based semiconductors with special emphasis on the use of advanced structuring and printing technologies to permit integration and add additional functionality. He has over 150 publications and 4 granted patents. His research achievements include the invention of a low cost method to obtain single frequency semiconductor lasers and a structure to significantly enhance the directionality of light from LEDs. He is the coordinator of the EU-funded TOP-HIT project and has been a partner in many European projects. He is a principal investigator in the Science Foundation Ireland funded Irish Photonic Integrated Centre (IPIC).

Imec's silicon photonics platform enabling 100Gb/s OOK optical links.

P. Absil
Director
imec, Leuven, Belgium

Abstract
With the emergence of the Internet of Things there will be an unprecedented growth in data center infrastructure needs requiring deployment of novel technologies with improved performance at lower power consumption and lower cost. Addressing these requirements, optical solutions are replacing copper cables for the intra-data center interconnects with increased lines data rates.
In this presentation we will present the latest performance updates of imec silicon photonics platform demonstrating 100Gb/s OOK optical links enabling the next generation of optical transceivers.

Biografie
Philippe Absil, Ph.D. is the director of the 3D and optical I/O technologies department at imec since 2013 and has been responsible for the silicon photonics technology platform development since 2010. Before that he spent seven years managing the advanced CMOS scaling program at imec. In the early 2000’s he developed the passive photonics platform technology for Little Optics Inc., Maryland, USA. He earned his Ph.D. degree in 2000 from the department of electrical engineering of the University of Maryland at College Park, USA. His doctoral work contributed to the early demonstrations of semiconductor micro-ring resonators.

SiGe BiCMOS and Photonic technologies for high frequency and communication applications

A. Mai
Department Head
IHP, Technology, Frankfurt (Oder), Germany

innovations
for high
performance
microelectronics

Abstract
In last decades the continuously improvement of SiGe-BiCMOS
increasing demand for novel high speed mm-wave application
radar or imaging and sensing systems. Moreover photonic-ele
scalability of certain photonic solutions moved into the focus o
worldwide. In this talk we will present recent progress in devic
heterojunction bipolar transistors and related BiCMOS technolo
regime as well as monolithic integrated silicon photonic compo
environment for electronic-photonic-circuit technologies. Base
developments for broadband optical communication, high freq
communication up to 240 GHz as well as transceiver circuits a
be presented.

Biografie
Dr. rer. nat. Andreas Mai received his diploma degree in physic
Brandenburg in 2006 and his PhD in 2010. He joined the “Proc
Technology department and his main research was focused on
SiGe-BiCMOS technology for mm-wave applications and the in
transistors. He leaded the “Process Integration” group with the
certain research activities as well as technology developments
department head of the “Technology-Department” in IHP in 20
of the ECS-SiGe processing symposia and head of the Joint-Lab between University of Applied
Sciences Wildau and IHP.