Integrated Photonics

Germanium Substrates for Photonics: GaAs Replacement Advantages and New Production Possibilities through CMOS Integration

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Abstract
Fast growth of consumer and automotive markets drives developments of new photonic devices such as micro-LEDs, multi-junction VCSELs and imagers both in the NIR and SWIR spectrum. While most of the photonics devices produced today are manufactured using GaAs substrates as a platform, there are more and more developments showing advantages of using Germanium (Ge) over GaAs. In this presentation we are focusing on technical advantages of using Ge, explain nuances of epitaxial growth on Ge substrates such as auto-doping effects and anti-phase domains and how to avoid them. In addition, we are going to discuss in more details the environmental and financial benefits of performing Ge substrate recycling for volume applications.
Another aspect of photonics device manufacturing is processing of epitaxially-grown wafers into functional devices. While most of the photonics devices are manufactured by traditional III-V IDMs and foundries, cutting edge photonic chips could be made in close collaboration between III-V companies and Silicon semiconductor / CMOS players in order to improve a form-factor, device performance and to drive down production costs. This possibility is currently limited by GaAs wafer size and CMOS fab contamination requirements. Umicore works on 8’’ and 12’’ Ge substrates that can serve as a bridge between III-V world and Semiconductor industry due to the size and Germanium material compatibility with CMOS specs. In this presentation we are going to present our roadmap to CMOS compatible Ge wafer development.

Biography
Ivan currently serves as a Business Development Manager at Umicore, where his focus lies in Germanium-based materials for the photonics market. He specializes in Vertical-Cavity Surface-Emitting Lasers (VCSELs), Light Detection and Ranging (LiDARs), and Augmented Reality/Virtual Reality (AR/VR) technologies.
Before joining Umicore, Ivan gained substantial experience in the field of microelectronics, having worked at multiple companies including ASM International and IMEC.
Ivan holds a PhD in Chemistry from KU Leuven in Belgium. His research, undertaken at IMEC, revolved around exploring various techniques for metal deposition in microelectronics.

Photonic IC Design: Innovation and Scalability

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Abstract

Photonic integrated circuits are steadily growing in scale from just 5-10 integrated components to hundreds, as well as in number of process steps and materials. Because of the breadth of the application space, numerous material and process platforms serve different submarkets. To increase IC complexit, re-use and addressable markets, heterogenous integration of dies and chiplets of different optical materials is becoming a market reality.There is an equal diversity in the maturity level of the photonic IC technologies.
Device design, compact modeling, circuit analysis, placement and routing and verification all require tools and algorithms specific to the physics as well as application requirements of phtoonic ICs. We will discuss recent technology innovations in photonic design automation technology of photonic ICs to address the above scaling challenges.

Biography

Pieter Dumon is CTO of Luceda Photonics, which he co-founded in 2014 as a spin-off from Ghent University, imec and VUB. He obtained his EE MSc degree in 2002 and a PhD in photonics in 2007 with work on silicon photonic wavelength filters. Pieter coordinated ePIXfab, the first multi project wafer service for photonics from 2007 until 2014, where he extended the collaboration to include more technology providers as well as design and packaging providers. At Luceda Photonics, he is responsible for R&D and leads the PDK team that manages over 30 photonic design kits of more than 20 photonic foundries.