A silicon photonics platform with heterogeneous III-V integration

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Abstract:

We will present an overview of the work by Ghent University and imec on a multipurpose photonic platform based on silicon technology with heterogeneous integration of III-V materials. Silicon photonics is widely considered to be the most promising technology to realize a high-performance, low-cost and high-volume photonic platform that can enable complex VLSI photonic functionality. One of the key enablers for silicon photonics is the possibility leverage existing silicon processing technology. Silicon as a material is exceptionally suited for compact passive waveguide circuits, but for light detection, and especially generation, III-V materials are by far superior. Heterogeneous integration of III-V materials on silicon photonic circuits has already been demonstrated in working lasers and efficient photodetectors. We will discuss the recent progress in adhesive III-V-on-silicon bonding technology, with working lasers, microlasers and different types of photodetectors, and how these devices can be used for different purposes.

III-V integration can only be successful if integrated in a fully functional silicon photonics platform. III-V materials are typically not used in a silicon process environment. To accommodate the III-V materials inside a silicon process flow, careful considerations have to be made for contamination and temperature budget. Imec is constructing a full silicon photonics platform which not only integrates passive silicon photonics, but also modulators, germanium photodetectors, thermal tuning, III-V integration and 3-D integration with electronics.

Bio:

Wim Bogaerts received a PhD in 2004 from Ghent University in 2004, on the design and fabrication of nanophotonic components, and especially photonic crystals using silicon technology. He continued to work on the subject of silicon photonics, co-ordinating the activities between the photonics group and the silicon process technology group in IMEC for the fabrication of SOI photonic nanostructures with advanced CMOS tools. This work spurred collaborations with tens of partners all over the world to combine nanophotonic designs into multi-project-wafer runs in IMEC, an activity which is now running as the silicon photonics platform ePIXfab. Currently he is still active in the photonics group as a postdoctoral researcher of the Flemish Science Foundation (FWO), active in both Ghent University and imec, coordinating the silicon photonics work, with a strong focus on active elements (modulators, detectors, tuners) and integration of silicon photonics with other technologies using 3D integration. He keeps a strong interest in telecommunications, information technology and applied sciences. He is a member of IEEE-LEOS and the Optical Society of America (OSA).