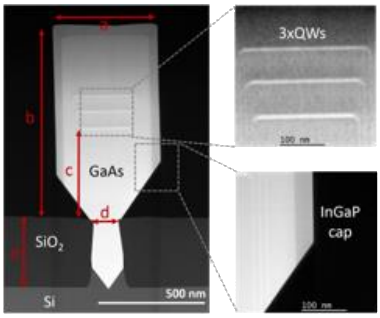
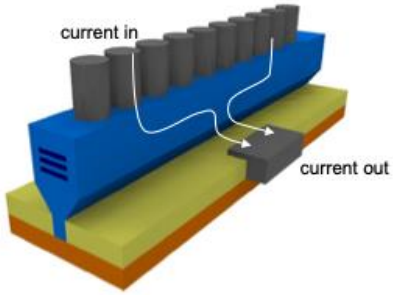
TWO PHD-VACANCIES IN THE CONTEXT OF THE ERC-ADVANCED PROJECT NARIOS "NANO-RIDGE ENGINEERING FOR DENSELY INTEGRATED III-V LASERS DIRECTLY GROWN ON SILICON"

We are looking for two PhD candidates, to develop new laser concepts in a unique material platform, that shows the promise of being a breakthrough in Silicon Photonics active devices.

Context: Although Silicon Photonics, i.e. using mature technologies from the CMOS-industry for realizing complex photonic ICs, progressed enormously, with industrial uptake by the biggest electronics manufactures, its real breakthrough, in e.g. large volume consumer applications or very short interconnects, is hampered by its lack of **a true waferscale optical source**. Combining aspect-ratio trapping, to suppress defects, and nano-ridge engineering, to shape the resulting material, we have developed a powerful platform to integrate direct bandgap III-V semiconductors on standard silicon wafers, using truly waferscale processes. The exceptionally high quality of this material was confirmed through morphological studies, gain and lifetime measurements and the demonstration of lasing under optical pumping.





For practical applications, electrical injection is key though, but thus far has been elusive as the dimensions of the resulting GaAs/InGaAs nano-ridges are too small to directly apply electrical contacts without introducing unacceptable losses. Therefore, NARIOS' primary objective is to propose device concepts that overcome the trade-off between optical confinement and efficient current injection. We aim at the demonstration of electrically injected microcavity lasers for low-power applications and the demonstration of a novel class of mW-lasers with in-plane or out-of-plane emission, exploiting the possibility to grow highly uniform arrays of these nano-ridges. These device-oriented objectives will be complemented by transversal objectives such as the development and extensive characterization of InGaAs nano-ridges for extending the lasing wavelength and exploiting novel concepts from recent literature to design lasers resilient to optical feedback and/or exhibiting lasing in a single coherent spatial mode.

Vacancy: In the context of NARIOS, we currently have two PhD-positions open within the Photonics Research Group (PRG) at Ghent University, an associated laboratory of imec. You will evaluate new device concepts applicable to this unique material platform and be involved in material characterisation. You will take the lead for one particular device concept and go through the full cycle of design and modelling, cleanroom fabrication and experimental verification. You will work mainly at Ghent University, in strong collaboration with several teams at imec (Leuven).

Background: You have a master in Photonics, Applied Physics, Microelectronics or similar.

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Application: http://photonics.intec.ugent.be/contact/vacancies/Application.htm

References:

- Y. Shi, …, D. Van Thourhout, Optical pumped InGaAs/GaAs nano-ridge laser epitaxially grown on a standard 300-mm Si wafer, Optica, 4(12), p.1468-1473 (2017) doi:10.1364/optica.4.001468 (2017)
- Z. Wang,…, D. Van Thourhout, Room Temperature InP Distributed Feedback Laser Array Directly Grown on (001) Silicon, Nature Photonics, doi:10.1038/nphoton.2015.199 (2015)

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