

InP-based photonic ICs

Citation for published version (APA):

Smit, M. K. (2013). InP-based photonic ICs. In *Proceedings of the 2013 OptoElectronics and Communications Conference held jointly with 2013 International Conference on Photonics in Switching (OECC/PS), June 30 - July 4, 2013, Kyoto, Japan* (pp. 1-2)

Document status and date:

Published: 01/01/2013

Document Version:

Publisher's PDF, also known as Version of Record (includes final page, issue and volume numbers)

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

www.tue.nl/taverne

Take down policy

If you believe that this document breaches copyright please contact us at:

openaccess@tue.nl

providing details and we will investigate your claim.

InP-based Photonic ICs

Meint K. Smit

COBRA Research Institute – TU Eindhoven, P.O. Box 513, 5600 MB Eindhoven, The Netherlands, m.k.smit@tue.nl

Abstract.

Generic InP-based foundry processes lead to a large reduction in entry costs and bring photonic ICs within reach for many SMEs and larger companies.

INTRODUCTION

The generic foundry approach will cause a revolution in micro and nanophotonics, just as it did in microelectronics thirty years ago. Generic integration causes a dramatic reduction in the entry costs for applying Photonic ICs in novel or improved products and brings them within reach for many SMEs and larger companies. So far, most applications have been in the field of telecommunications and datacommunications, but presently they are becoming much broader: examples are fibre sensor readout units, gas sensors, medical diagnostics and metrology.

GENERIC FOUNDRY APPROACH

In Europe, three integration technology platforms are active in introducing the generic foundry concept for the major integration technologies in Photonics: JePPIX for InP-based monolithic integration, ePIXfab for silicon photonics, and TriPleX for low-loss dielectric waveguide technology.

In the JePPIX platform Europe's key players in the field of InP-based photonic integration technology are cooperating on the development of a generic foundry model using generic integration processes: highly standardized integration processes that can be used for a broad range of different applications. Presently a number of large R&D projects are running, developing both the generic foundry technologies, and the infrastructure to make them accessible at low cost for a broad range of companies: design tools, component libraries, generic packaging technology and generic test equipment. This model will reduce the entry costs for companies that want to apply Photonic ICs in their products by more than an order of magnitude.

MULTI-PROJECT WAFER RUNS

Multi-Project Wafer Runs are a key concept in the generic foundry model. In an MPW run a number of different designs are combined on a single wafer, so that the costs of the wafer run can be shared by a number of different designs. This becomes possible once different chips can be fabricated in the same standardized integration process. Through Multi-Project Wafer Runs the entry costs for developing a Photonic ICs are strongly reduced because a chip designer can use a well developed high performance process, which he does not have to

develop himself, and for his designs he can buy some wafer area in an MPW run, which will provide him with a number of his chips without having to pay for the whole run. Further, he can use a dedicated design kit, including component libraries which will bring him a better design in a strongly reduced design time. Altogether, this will bring the costs of an experimental chip set down from hundreds of thousand Euros to something in the order of magnitude. It will bring Photonic ICs (PICs) within reach for many SMEs and larger companies for which the entry costs of today's technology are too high.

STATUS AND PROSPECTS

In 2012 the first experimental industrial foundry runs in InP-based technology were executed, with more than 30 chip designs for a variety of applications. The figure on the next page illustrates a few of the Application-Specific Photonic ICs (ASPICs) that have been designed and fabricated. Interest in participation is large. For 2013 we expect the first beta-runs with semi-commercial access for the technology that has been trialled in the EU-FP7 project EuroPIC, these are runs with small scale commercial access to processes that are not yet completely qualified. Dependent on the results, general commercial access can be expected in 2014 or 2015.

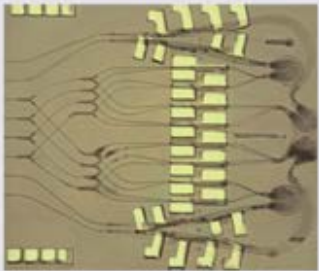

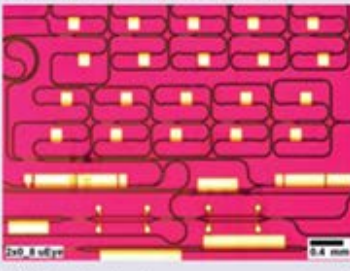
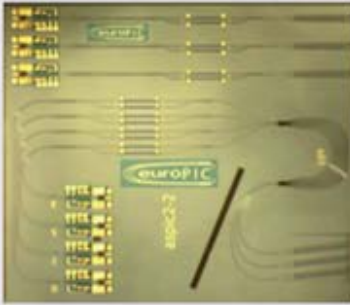
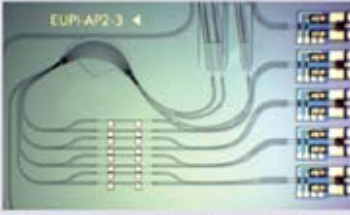
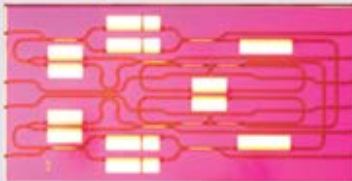

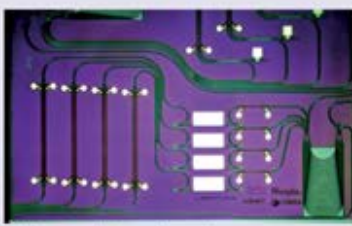


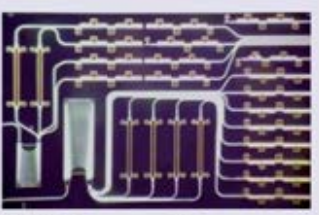
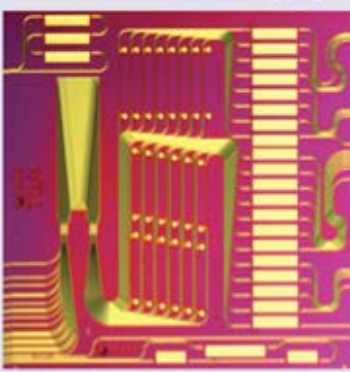
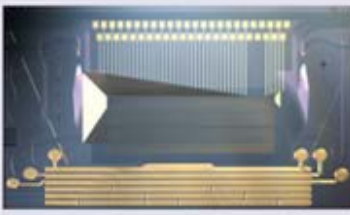
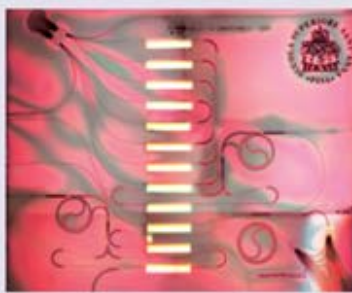

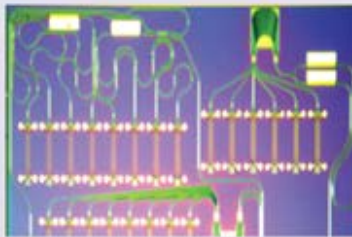
In the presentation the present status and prospects of InP-based Photonic foundry technology will be reviewed.

ACKNOWLEDGMENT

Funding by the FP7-EU projects EuroPIC and PARADIGM and the Dutch projects MEMPHIS and IOP Photonic Devices is gratefully acknowledged.

REFERENCES

- [1] M. Smit, X. Leijtens, E. Bente, J. Van der Tol, H. Ambrosius, D. Robbins, M. Wale, N. Grote, M. Schell, "Generic foundry model for InP-based photonics", IET Optoelectron, 2011, Vol. 5, Iss. 5, pp. 187–194. doi: 10.1049/iet-opt.2010.0068.
- [2] M.K. Smit, "Generic InP-based photonic integration technology", Proceedings of the 17th Opto-Electronics and Communications conference (OECC2012), July 2-6, 2012, Busan, Korea (pp. 289-290).

<p>Optical switching</p>  <p>4x4 space and wavelength selective switch</p>  <p>Fast optical switch matrix</p>	<p>Fiber sensor readout</p>  <p>Brillouin strain sensor readout</p>  <p>Fiber Bragg Grating readout</p>  <p>Fiber Bragg Grating readout</p>	<p>Variety of lasers</p>  <p>Widely tunable ring laser</p>  <p>Variable repetition rate pulse laser</p>  <p>Filtered-feedback multi-wavelength laser</p>  <p>tunable laser with integrated MZI modulator</p>
<p>Fiber to the home</p>  <p>WDM receiver</p>  <p>WDM transmitter</p>	<p>Medical and bio-imaging</p>  <p>Pulse shaper for bio-imaging</p>  <p>Integrated tunable laser for optical coherence tomography</p>	<p>Optical data handling</p>  <p>All-optical regenerator for constant envelope WDM signals</p>  <p>WDM to TDM Trans-Multiplexer</p>  <p>Pulse serialiser</p>

Examples of Application-Specific Photonic ICs (ASPICs) fabricated in InP-based generic foundry runs