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New Perspectives for Opto-Electronic Platform Technologies

IHP-scientists presented paper about a silicon nitride waveguide coupled Ge photodiode at IEDM

Frankfurt (Oder). Last week IHP-scientists presented their paper "Silicon Nitride Waveguide Coupled 67+ GHz Ge Photodiode for non-SOI PIC and ePIC Platforms" (S. Lischke, D. Knoll, C. Mai, A. Hesse, G. Georgieva, A. Peczek, A. Kroh, M. Lisker, D. Schmidt, M. Fraschke, H. Richter, A. Krüger, U. Saarow, P. Heinrich, G. Winzer, K. Schulz, P. Kulse, A. Trusch, and L. Zimmermann) at the 65th IEEE International Electron Devices Meeting in San Francisco. "We have demonstrated for the first time a Ge photodiode, directly coupled to a Silicon Nitride waveguide, with more than 67 GHz bandwidth, which can be fabricated with high yield and low metrics tolerances. This unique combination and the potential integration with high-speed electronics open new perspectives for opto-electronic platform technologies," said Dr. Stefan Lischke, scientist at IHP's technology department. He mentioned three possible applications: The combination of truly high-speed photodiodes with Silicon Nitride (SiN) waveguides could be the start for a novel active SiN platform e.g. aiming at integrated coherent receivers at wavelengths far below the O-band. The demonstrated devices are in principle compatible for co-integration with IHP's photonic BiCMOS process, which opens various opportunities for novel sensing or spectroscopic applications as well. And this work could pave the way towards a non-SOI based technology as an alternative to established SOI based photonic integrated circuit (PIC) or electronic-photonic integrated circuit (ePIC) platforms, e.g. IHP's photonic BiCMOS technology. Circuit fabrication on pure bulk-Si wafers would significantly relieve process complexity, time and thus costs.

IEEE International Electron Devices Meeting (IEDM) is the world's preeminent forum for reporting technological breakthroughs in the areas of semiconductor and electronic device technology, design, manufacturing, physics, and modeling. "Innovative Devices for an Era of Connected Intelligence" were the theme of this year's IEDM chosen to reflect the conference's focus on the processors, memories, 3D architectures, power devices, quantum computing concepts and other technologies needed to drive diverse new applications of electronics technology forward. The 65th annual IEDM featured a technical program of 238 papers given by many of the world's top scientists and engineers in the field. IEDM is the flagship conference for nanometer-scale CMOS transistor technology, advanced memory, displays, sensors, MEMS devices, novel quantum and nano-scale devices and phenomenology, optoelectronics, devices for power and energy harvesting, high-speed devices, as well as process technology and device modeling and simulation.

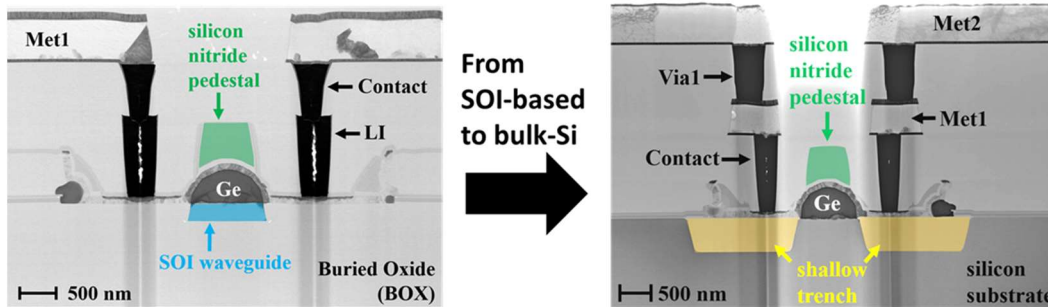


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Left: SOI based germanium photodiode
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Right: Bulk-Si based photodiode

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Further Information:

Video IEDM: <https://youtu.be/b6kZnUOVG7Q>

About IHP:

The IHP is an institute of the Leibniz Association and conducts research and development of silicon-based systems and ultrahigh frequency circuits and technologies including new materials. It develops innovative solutions for application areas such as wireless and broadband communication, security, medical technology, industry 4.0, automotive industry, and aerospace. The IHP employs approximately 300 people. It operates a pilot line for technological developments and the preparation of high-speed circuits with 0.13/0.25 μm BiCMOS technologies, located in a 1000 m² class 1 cleanroom.

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