Imec demonstrates first nanophotonics components on 300mm silicon photonics wafers using optical lithography

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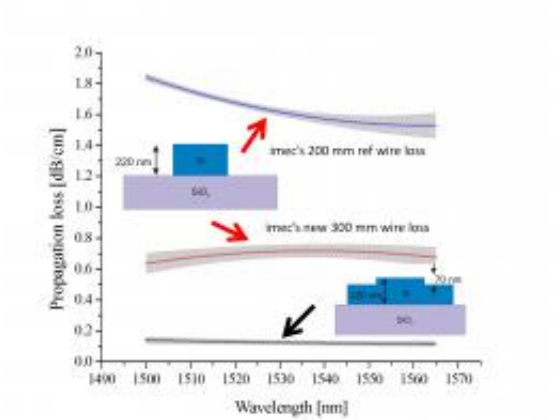

Propagation loss of photonic wire

Imec today announces the world-first realization of functional sub-100nm photonics components with optical lithography on 300mm silicon photonics wafer technology. Using 193nm immersion lithography, imec achieved the lowest propagation loss ever reported in silicon wire waveguides, and succeeded in patterning simpler and more efficient fiber couplers. Imec's achievement is an important step in bringing Si photonics technology in line with CMOS industry standards.

Imec's industrial affiliation program on optical I/O explores the use of photonics solutions for realizing high-bandwidth I/O in high

performance computing systems. The program is developing Si photonics processes, devices and circuits using state-of-the-art CMOS fabrication processes. Until now, many nanophotonics components have only been demonstrated using lab-scale techniques such as e-beam lithography. Imec succeeded to demonstrate functional Si nanophotonics devices on industry-compatible 300mm wafers using 193nm immersion lithography and 28nm CMOS processes. This achievement is crucial in bringing Si photonics technology to CMOS industry adoption.

The optical waveguides on 300mm wafers have a very low propagation loss well below 1dB/cm. Moreover, imec patterned sub-wavelength features and demonstrated optical fiber-chip couplers using 193nm immersion lithography. By applying 193nm immersion lithography for patterning waveguides as well as fiber couplers, imec eliminated one patterning step in the processing of photonics devices. This resulted in a significant reduction of the processing cost. By demonstrating low phase errors on 450nm arrayed waveguide gratings, imec's patterning platform using 45nm mask technology and 193nm immersion lithography has proved it can yield a very uniform waveguide width within a device.

"Imec's results are an important step in bringing Si photonics technology in line with CMOS industry standards," said Philippe Absil, Director of the optical I/O program at imec. "Our achievement with 193nm immersion lithography and 28nm CMOS processes on 300mm wafers is an important step in Si photonics development to demonstrate the manufacturability of highly integrated components. Possible applications are next-generation short-reach interconnects, which we expect to go into manufacturing by 2015."

These results were obtained in cooperation with INTEC, imec's associated lab at the Ghent University, and with imec's key partners in its core CMOS programs Globalfoundries, INTEL, Micron, Panasonic, Samsung, TSMC, Elpida, SK Hynix, Fujitsu, Toshiba/Sandisk, and

Sony.

Provided by IMEC