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Biography

Qing Fang received B.E. degree in material science engineering from Wuhan University of Technology in 2002 and Ph.D. in microelectronics and solid-state electronics from Institute of Semiconductors of Chinese Academy of Sciences in 2005. From 2006-2011 & 2012-2016, he worked for Institute of Microelectronics (IME) in Singapore, as a Scientist. He joined Institute of Semiconductors of Chinese Academy of Sciences from 2011-2012, as a professor. He is currently a professor in Kunming University of Science and Technology. His interests mainly cover the fields of Si-based optoelectronics devices and integration technology. He has published more than 100 journal/conference papers in silicon photonics.

Presentation Title: AWG-based silicon photonics devices on SOI platform

Abstract:
In this paper, we demonstrated several AWG-based silicon photonics devices fabricated with deep UV lithography on SOI platform, including cascaded AWG, AWG-based receiver with fiber-to-waveguide converters, AWG-based OADM and folded AWG with ring-reflectors. In a thin top silicon layer, the silicon nanowire AWG has a performance of relative high crosstalk. In order to reduce the crosstalk, we designed and fabricated a 4-channel cascaded AWG. Compared to the normal single silicon photonics arrayed waveguide grating with a crosstalk of ~ -12.5 dB, the crosstalk of more than 20 dB has been dramatically improved in this cascaded AWG. The AWG-based OADM device is composed of two 1×8 AWGs, MZI thermo-optic switch array and crossing array, by which 8 signals can be loaded or uploaded. The channel spacing is around 3.2 nm at the wavelength of 1550nm and the crosstalk is less than -20 dB. The dynamic extinction is around 15 dB by thermal effect and the power consumption for a single channel is less than 12.3 mW. The 8-channel receiver was designed and fabricated on a SOI wafer with 1μm-thick top silicon layer, which was composed of 5×8 AWG and 8 Ge-based butt-coupled photodetector array. The AWG device was designed on a thick SOI wafer for a good crosstalk performance. However, The silicon waveguide with a height of 1μm has a coupling issue with a cleaved standard optical fiber. In order to reduce the coupling loss with the cleaved fiber, a new cantilevered fiber-to-waveguide converter was designed to integrate at the output/input waveguide of this receiver. The measured coupling loss of this converter is around 2.4dB/facet by using a cleaved single mode fiber. The 3dB-bandwidth of this butt-coupled photodetector is more than 30 GHz at a reverse bias of -1V. The transmission capability of this receiver is more than 400Gbps. Compared to other silicon photonics devices, the AWG size is not small. A 1×4 folded silicon photonics AWG was designed and fabricated on a SOI wafer with 340nm-thick top silicon layer. This folded AWG was integrated with ring-mirrors at the end of arrayed waveguides. The optical signals are launched into the input waveguide and coupled into the arrayed waveguides through the input slab waveguides. At the end of arrayed waveguides, the signals are reflected by the ring-mirrors. The reflected signals go back to the arrayed waveguides and the input slab waveguide in sequence, and then they are separated into the four output waveguides. The measured transmission loss of this folded AWG is about 3.5 dB and the crosstalk is around 20 dB. The measured channel spacing is 6.7 nm. This size of the demonstrated arrayed waveguide grating is only half of the normal arrayed waveguide grating.