Trimming of Athermal Silicon Resonators

Technology #15448

Applications

- WDM devices, electronic-photonic integrated chip, waveguide, resonator

Problem Addressed

Silicon based ring resonators form an integral part of the WDM architecture of an electronic-photonic integrated chip. However, fabrication variations and temperature fluctuations alter the response of the optical filters. Active tuning involving heaters and thermo-electric coolers of these resonators have been proposed to keep the response within desirable limits, but these solutions prove power inefficient and the number of I/O lines limits the integration density, and thermal tuning energy constitutes a significant portion of the energy cost.

Also, there is a shift in filter response of an athermal ring, which consists of a negative thermo-optic (TO) polymer cladding, which needs to be tuned back to its desired value due to fabrication variations.

Technology

This invention is about a Silicon based trimmable athermal ring resonator with energy efficiency driving Moore's law. The prototype design rule requires encapsulation of a-Si core with a thin layer of As_2S_3 before the polymer top cladding deposition. Trimmable athermal waveguides leverage the photosensitivity of As_2S_3 and negative TO coefficient of polymers to address the fabrication and temperature sensitivities of Si based resonators. Constraints of TO resonance shift lower than 1.3 pm/K and trimming window of 5 GHz imposed by a 20 GHz channel spacing can been successfully satisfied by resonators fabricated with these waveguides.

Advantages

- Minimum TO peak shift and high trimming resolution
- Closer channel spacing and higher channel count
- Bandwidth multiplication due to wavelength division multiplexing (WDM) (incentive for electronic-photonic integration)

Categories For This Invention:

Photonics
Data Communications

Intellectual Property:

Athermal photonic waveguide with refractive index tuning

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Publications:

Post-Fabrication Trimming Of Athermal Silicon Waveguides
OPTICS LETTERS
Vol. 38, No. 24 / December 15, 2013
High Capacity, Photo-trimmable Athermal Silicon Waveguides
Group IV Photonics (GFP), 2012 IEEE 9th International Conference
pp.45,47, 29-31 Aug. 2012

External Links:

EMAT @ MIT
http://photonics.mit.edu/PI.html

Image Gallery:

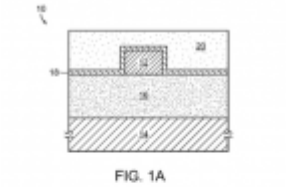

FIG. 1A

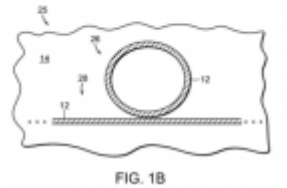

FIG. 1B

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