PERIODIC WAVE GUIDE BRICKED WAVE SUB-LENGTH AND DEVICES THAT MAKE USE OF SUCH WAVE GUIDE.

Description:

The silicon platform (Silicon on Insulator, SOI) is the platform that has prevailed mainly in integrated optics and for which the largest number of applications are being developed. Despite its enormous advantages (high integration capacity, possibility of reusing all the manufacturing processes used in the integrated electronics, reduced size of the devices, ...), in order to achieve high-performance optical devices it is necessary to be able to synthesize materials with characteristics different. In this sense, the irruption of the periodic sub-wavelength dielectric waveguides (SWG, for its acronym in English Sub-Wavelength Grating) has been fundamental, since combining only silicon and silicon dioxide in the appropriate proportion, has made it possible to synthesize equivalent artificial materials whose properties (refractive index and its dependence on wavelength or dispersion), can be easily controlled. However, when operating at near-infrared wavelengths (? = 1.55µm), the minimum dimensions required for SWG guides are in the order of 100nm, or less, which is very difficult to achieve with manufacturing technology in DUV-193 mass that is usually used (from the English Deep Ultra Violet 193 nm). In addition, in the design of a multitude of integrated optical devices, there is a need to also control the anisotropy or dependence with the polarization of light of the synthesized equivalent material, without this meaning complicating the manufacturing process due to the incorporation of new materials, or increasing the number of engraving steps. The present invention solves the problems raised above, and for this purpose, a new sub-wavelength periodic waveguide topology is proposed, as a first object of the invention, which due to its structural characteristics will be called "bricked" ("Bricked-SWG"). In other objects of the invention, various devices are presented that make use of the proposed structure, such as a modal adapter, a power divider-90º phase shifter, or a polarization separator.

Keywords:

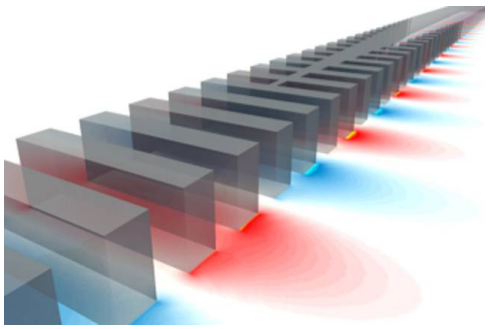
Optical Communications, Telecommunications, Wave Guides, Photonics, Integrated Optics, Anisotropy, Metamaterial

Sectors:

ICT, Engineering

Areas:

Telecommunications, Hardware / Devices / Components, Components, Communications, New technologies



Advantages:

The advantages of the new periodic guide are as follows. In the first place, it preserves all the properties that SWG waveguides have to control the index of refraction and dispersion of the synthesized equivalent materials, and also incorporates the possibility of also controlling the anisotropy, and therefore also, the resulting birefringence. The second advantage they present is that for their manufacture, the minimum required sizes will be able to be increased, which will facilitate their mass manufacture using DUV lithographic techniques, and therefore reduce the associated costs. The third advantage is that it does not need to incorporate new materials or increase the number of engraving steps, so it could be integrated into the same chip with guides or conventional photonic devices and all manufactured during the same engraving step.

Uses and Applications:

The invention could have a huge impact on all applications that make use of integrated optical technology: transceivers for long-distance and short-distance high-bandwidth optical communications in data centers, photonic biosensors, environmental sensors, spectrometers or systems. LIDAR (Laser Imaging Detection And Ranging).

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