

Advanced nonlinear signal processing in silicon-based waveguides

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Abstract—This talk presents recent progress in optical signal processing based on compact waveguides fabricated mainly using silicon germanium alloys. Applications include supercontinuum generation, wavelength conversion and signal regeneration.

Keywords—silicon photonics; nonlinear optics; optical signal processing; optical communications

OUTLINE

Whilst nonlinear optical signal processing has benefitted vastly from advances in optical glasses and developments in optical fibre design and fabrication, it is widely accepted that there is still a lot to be desired from materials that are to constitute the nonlinear elements in processing systems. Small-dimension waveguides based on silica have recently shown great potential in this direction, and a number of important demonstrations have been reported using pure silicon waveguides (see e.g [1]). Here we review recent progress, and focus on the potential of silicon germanium waveguides, in which the inclusion of germanium allows flexibility in the manipulation of the optical properties of the nonlinear element [2, 3] – see Fig.1. Recent applications in wavelength conversion [4], signal regeneration [5] as well as supercontinuum generation [6] are reviewed.

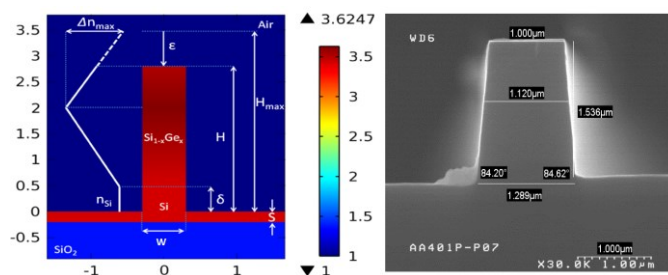


Fig. 1. (Left) Design of a silicon germanium waveguide exhibiting a graded refractive index variation; (right) scanning electron microscopy image of the fabricated waveguide [6].

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