



Ion Implanted Bragg Gratings

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The development of high speed integrated silicon photonics circuits will significantly affect the evolution of ultra fast telecommunication systems, Tera-scale computing applications, and optical sensors. Silicon photonics has witnessed an enormous growth in the last few years, and it is supported by well established technologies that have been used for decades in the microelectronics fabrication.

Bragg gratings are often employed as building blocks in optical networks, as well as in the fabrication of optical filters and integrated photonics sensors. The most popular grating configurations are either fibre based or fabricated by etching into optical waveguides. Fibre Bragg gratings are not suitable for micron and sub-micron scale photonics integration, whereas etched configurations often require very complex fabrication process. This project aims to explore the possibility of fabricating a silicon on insulator (SOI) waveguide based Bragg grating by selectively altering the refractive index of silicon by ion implantation.

By using established ion implantation processes it is possible to introduce dopants and/or structural modifications in the crystalline lattice, in order to obtain a refractive index change suitable for grating fabrication. The periodic structure is transferred on a silicon waveguide by implanting the material through a hardmask.

A Bragg grating produced by this technique retain a nearly planar surface, this makes it a very interesting candidate for photonic applications possessing surface sensitive topography, such as wafer bonding techniques required for three dimensional photonic circuits. Moreover, since implanted gratings stability is subject to temperature, the application of these devices could prove to be interesting whenever an erasable reflecting element is required. This structure could be useful to test damage in future integrated photonics circuit in a similar way to that in integrated electronics circuit.

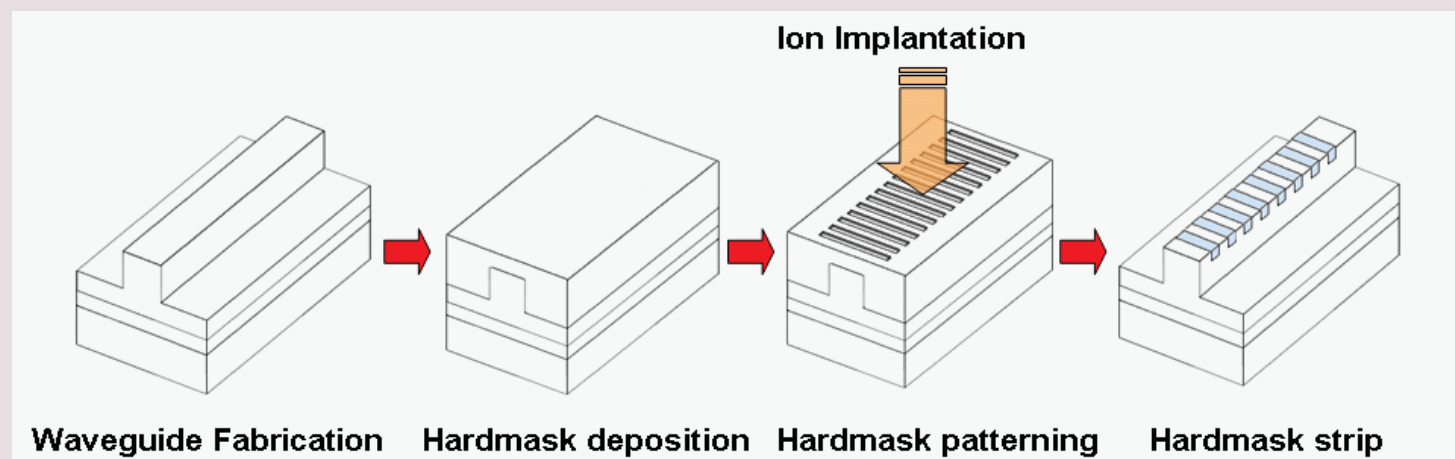


Figure 1. Fabrication procedure outline proposed for ion implanted Bragg gratings