

Simultaneous Direct UV-writing of channel and Bragg grating structures

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Abstract

Direct UV-writing is a planar lightwave circuit fabrication technique ideal for rapid prototyping and small batch fabrication. The technique is based on the refractive index increase of a glass through exposure to a tightly focused UV beam. The translation of this beam relative to a suitable substrate allows the definition of 2-d waveguide structures such as s-bends and power couplers without the need for photolithographic or subsequent processing.

Traditionally, Bragg grating structures are superimposed through UV exposure onto existing waveguides, increasing the fabrication complexity (therefore time and cost) and modifying the original properties of the channel. As an alternative to traditional techniques we have developed a Direct Grating Writing technique (DGW) retaining the advantages of Direct UV writing for channel definition but allowing both the grating and channel structure to be formed simultaneously using the same material response.

This simultaneous approach has several advantages compared to conventional techniques. Both the channel structure and grating parameters are controlled entirely through software, resulting in a single design-to-device processing step for a wide range of structures. The grating writing technique is highly flexible, not requiring a phase mask, and allows a wide range of grating periods and profiles to be written with the same setup. As the grating and channel structure result from the same index change the contrast of the grating can be controlled between nothing to almost double the average index of the channel without effecting the strength of the waveguide, all resulting in a fabrication system of virtually unparalleled flexibility.