Novel technique for measuring dispersion and detuning of a UV written silica-on-silicon waveguide

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We shall present a new method of measuring the dispersive properties of UV written waveguides in the silica-on-silicon platform used to fabricate planar Bragg gratings. The technique involves direct measurement of the modal refractive index of a waveguide produced in the material. The data obtained also provides additional information about the spectral range of Bragg grating inscription.
This direct writing technique reported previously [1] differs from fibre Bragg grating fabrication [2] by the small spot size of the writing beam and permits detuning of the Bragg wavelength from 1250nm to 1625nm. The fabrication technique provides the exact period of the grating and thus interrogation of the gratings produces information on the effective index of the mode. A series of integrated gratings were fabricated in a direct UV written waveguide via the direct grating writing technique in order to measure the wavelength dependence of the refractive index of the material. The Sellmeier curve obtained is shown (figure 1 inset).
Measuring how the reflectivity of the Bragg gratings changes with wavelength gives additional information on the ability to detune the direct grating writing technique. For a duty cycle of 0.5, the response is as shown below (figure 1). We shall show how the duty cycle of the writing method controls the reflectivity of the Bragg grating.
We shall present our latest findings regarding the dispersion of the silica-on-silicon platform, and further investigations into effective grating production towards the visible region.

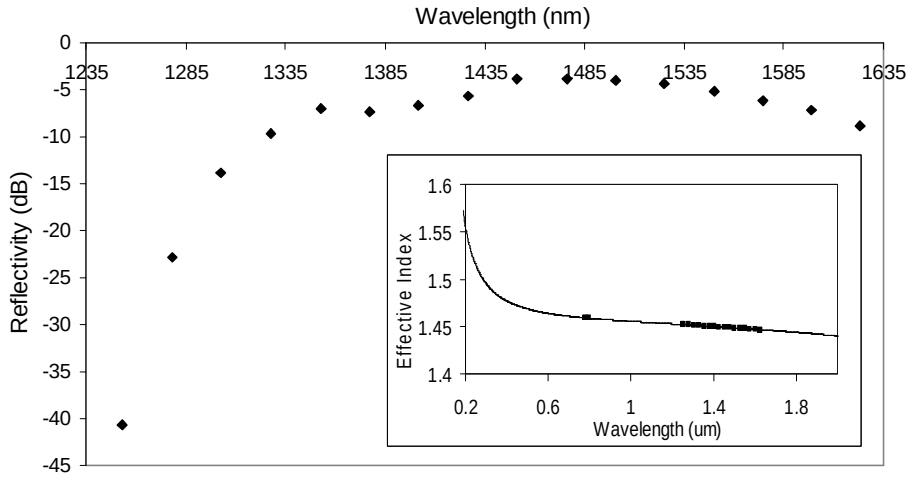

Figure 1. Plot of reflectivity of Bragg gratings against wavelength and Sellmeier curve obtained for waveguide (inset). Fitting the Sellmeier curve yields a zero dispersion wavelength of 1212nm.

References

[1] Emmerson GD, Watts SP, Gawith CBE, Albanis V, Ibsen M, Williams RB and Smith PGR. 2002. Fabrication of directly UV-written channel waveguides with simultaneously defined integral Bragg gratings. *Elec. Lett.* 38 (24) 1531-2.

[2] Meltz G, Morey WW and Glenn WH. 1989. Formation of Bragg gratings in optical fibres by a transverse holographic method. *Opt. Lett.* 14 (15) 823-5.