Phase modulation technique for high modulation wide band planar Bragg grating fabrication

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Direct UV Grating Writing (DGW) is effective route for fabricating high quality Bragg gratings, similar to fiber Bragg gratings, in a planar geometry. We will present a phase modulation controlled DGW method using an Electro-Optical Modulator for planar Bragg grating fabrication that offers improved performance. This new approach not only provides much greater modulation depths for stronger and shorter Bragg gratings but also offers greater fabrication speed and a higher fidelity of control than previous amplitude modulation methods [1].

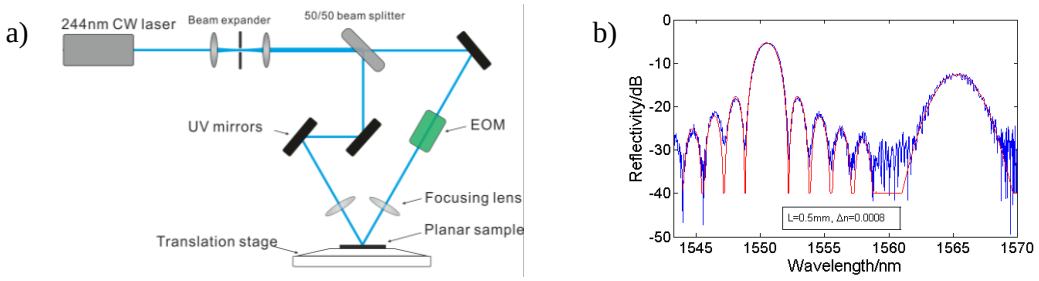

Fig. 1.a) Shows a schematic of the UV writing system. **b)** Reflectivity of two 500 µm simple uniform and Gaussian apodized planar Bragg gratings, blue line experimental data and red the modeled spectra, the modulation depth is 0.8×10^{-3} .

A schematic of the grating writing system is shown in figure 1 (a). Phase modulation is applied to one arm of the interferometer and both beams are focused into the core of a photosensitive silica-on-silicon sample which is constantly translated under the spot. This phase is controlled such that a rolling fringe pattern is generated which is synchronized with the translation of the waveguide. The method offers rapid writing speeds with grating refractive index modulation (Δn) up to 10^{-3}. By applying apodization to the grating design we can achieve tailored grating responses e.g. sidelobe suppressed Gaussian gratings and flat top filters. An example reflection spectrum from a waveguide written with two 500 µm Bragg gratings is shown in figure 1(b).

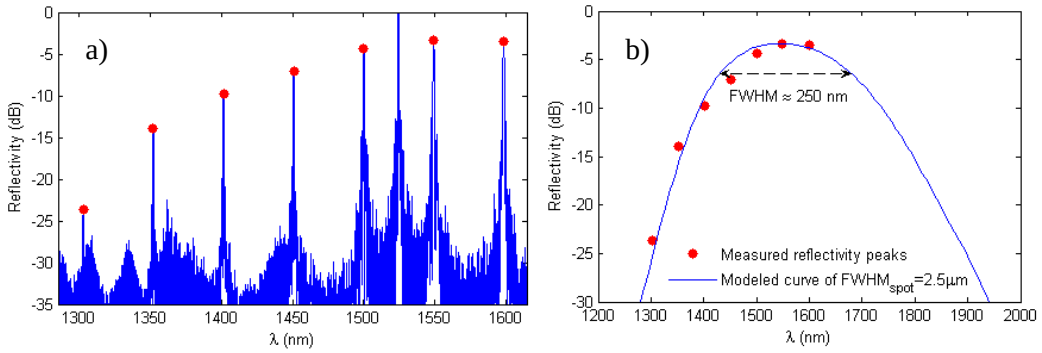

Fig. 2.a Measured reflection spectrum of a waveguide containing 8 written sequential Bragg gratings from 1260nm to 1640nm. **2.b** Shows the peak grating reflectivity as a function of wavelength, the blue line shows the modeled reflectivity assuming a writing spot size of 2.5µm.

Figure 2 illustrates the wide fabrication bandwidth of the technique, demonstrating a FWHM of ~250nm.
We shall discuss the implementation of the technique and our latest advanced grating structures fabricated with the system such as Hilbert transformers.

References

[1] G.D. Emmerson, S.P. Watts, C.B. Gawith, V. Albanis, M. Ibsen, R.B. Williams, and P.G.R. Smith "Fabrication of directly UV-written channel waveguides with simultaneously defined integral Bragg gratings", Electron. Lett, **38**(24), 1531–1532 (2002).