

# UV written planar Bragg grating sensors - geometries and applications

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Bragg gratings in optical fibres are a well developed technology that finds many applications in photonics, including wavelength stabilization, dispersion compensation, and use as temperature and strain sensors. In recent years we have developed planar Bragg grating devices as integrated counterparts to fibre based devices[1]. The implementation of Bragg gratings in planar opens many new degrees of freedom because it is possible to make more intricate circuits incorporating splitters, interferometers, couplers, etc.

In our work, the planar Bragg gratings are fabricated using a direct UV writing method in which two focused 244nm argon ion beams are overlapped into a photosensitive silica-on-silicon substrate. By translating the sample, and modulating the laser a channel waveguide can be written which contains integrated optical circuitry and Bragg gratings. The grating technique is inherently flexible and allows a wide range of periods and grating designs to be used.

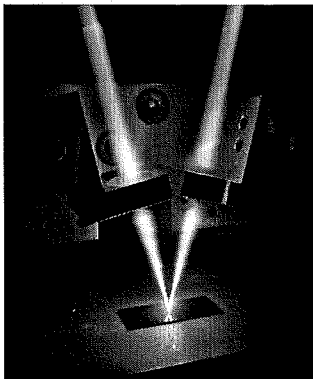


Image of two beam apparatus for direct writing of UV planar waveguide sensors.

The planar format lends itself particularly well to creating evanescent wave Bragg sensors[2] because it is far easier to incorporate fluidics and sample manipulation than with etched fibre approaches. Furthermore, the ability to place multiple gratings on a single chip allows for in-situ temperature compensation.

The work reported here will include latest results on Bragg gratings being used as biological and chemical sensors, on their use with liquid crystals to create tunable filter elements[3], and on new geometries in which wafer dicing technology is combined with UV writing to allow unprecedented flexibility and ease of use in planar grating sensors.

[1] G.D.Emmerson, S.P.Watts, C.B.E.Gawith, V.Albanis, M.Ibsen, R.B.Williams, P.G.R.Smith  
Fabrication of directly UV-written channel waveguides with simultaneously defined integral Bragg gratings  
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[2] I.J.G.Sparrow, G.D.Emmerson, C.B.E.Gawith, P.G.R.Smith  
"Planar waveguide hygrometer and state sensor demonstrating supercooled water recognition"  
Sensors and Actuators B: Chemical 2005 Vol.107 pp.856-860

[3] F.R.M.Adikan, J.C.Gates, H.E.Major, C.B.E.Gawith, P.G.R.Smith, A.Dyadyusha, M.Kaczmarek, I.J.G.Sparrow, G.D.Emmerson  
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