Integrated Planar Bragg Grating Sensors: Towards an Oxygen Sensor

Dominic Wales[A,B], R. Parker[A,B], J. Gates[B], M. Grossel[A], P. Smith[B]
[A]School of Chemistry and [B]Optoelectronics Research Centre, University of Southampton, Southampton, Hampshire, SO17 1BJ, United Kingdom
E-mail: dw405@soton.ac.uk

Sensors play an important role in measuring changes in the environment. Optical sensors operating at well established telecoms wavelengths demonstrate many benefits over electronic sensors. These include immunity to EM interference, absence of spark risk in flammable environments and remote interrogation of large arrays over many tens or even hundreds of km's [1].

Optical waveguides can be written with a UV-laser into a photosensitive planar glass layer to produce a wide range of optical devices. One such device is the Bragg grating; an optical device that reflects at one particular wavelength of light and transmits all others. The wavelength reflected by a Bragg grating is dependent on the refractive index it is exposed to, an inherent property of a material. Exposing these Bragg gratings enables the detection of subtle changes in refractive index in the local environment, with examples of chemical sensors previously demonstrated [2].

It is well known that methylene blue exhibits a reversible colour change upon exposure to oxygen [3]. This quantitative change in absorption possesses an associated change in refractive index [4]. Here we present developments on incorporating methylene blue within a porous silica sol-gel and combining this with planar integrated optics to produce a refractive index sensor for the sensing of gaseous oxygen. Development and fabrication will be discussed together with the latest sensing results.

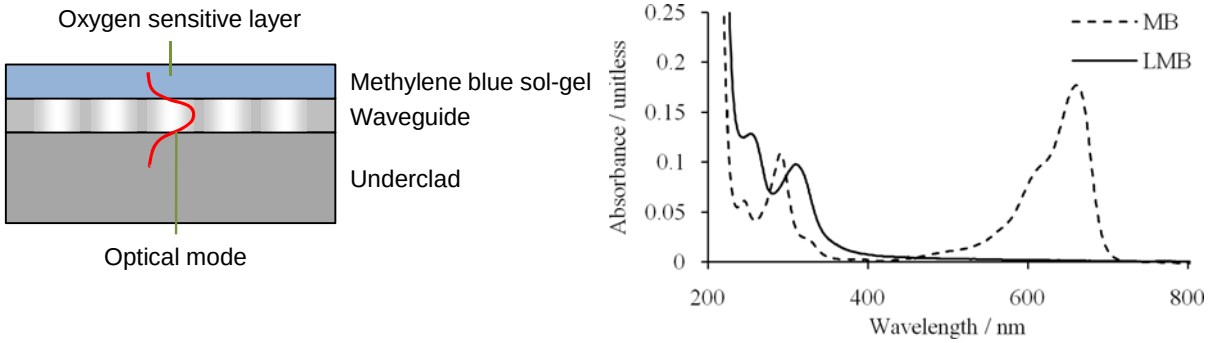

Fig. 1: Schematic of oxygen sensing device (left) and a UV-Vis spectra highlighting the colour change upon reduction of methylene blue.

References:

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