Conference code: COO105

New geometry for planar UV written refractive index sensors.

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Principle author biography: James Gates is a Research Fellow at the Optoelectronics Research Centre (ORC) at the University of Southampton. He gained his PhD at the ORC in 2003 which concentrated on the investigation of the evanescent fields of photonic devices using near-field microscopy. His following research fellow position in the Physics department of the continued in the area of nanophotonics. As of 2006 he has been working on novel devices using UV written waveguides.

We shall present some of our recent results from our work on UV written planar waveguide refractive index sensors. Refractive index of an analyte is measured through the perturbation of an optical mode, interrogation of the modal index is achieved via the reflected spectra from a Bragg grating defined in the same process as the channel waveguide.

It has previously been shown that these devices can be used to sense liquid/solid phase changes and have highlighted their potential for use as biological and chemical sensors. Recent results demonstrate sensitivities of 10^{-6}, rivaling that of the highest specification commercial SPR based measurement techniques.

Here we introduce a new geometry which embraces the benefits of planar technology to realise new integrated devices. The geometry allows several different sensors to be defined on the same substrate each offering complementary information. Such information may include index as a function of penetration depth for surface binding analytes, interrogation wavelength for dispersion analysis, enhanced sensitivity in specific index ranges and temperature compensation. We shall also outline the inherent fabrication advantages and device feature benefits, including a reduction in return loss, spectral artefacts and a suggested reduction in stress induced birefringence. The silica sensing surface opposed to gold used in SPR devices opens new avenues to exploit surface binding. With a marked reduction in complexity and cost these devices may have significant impact in future sensor markets.

Keywords: direct UV writing, refractive index sensor, planar Bragg grating.