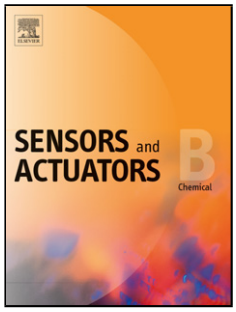

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PII: S0925-4005(17)31960-3
DOI: https://doi.org/10.1016/j.snb.2017.10.060
Reference: SNB 23364

To appear in: *Sensors and Actuators B*

Received date: 29-5-2017
Revised date: 23-9-2017
Accepted date: 11-10-2017

Please cite this article as: M.Oliva-Ramírez, J.Gil-Rostra, F.Yubero, A.R.González-Elipe, Robust polarization active nanostructured 1D Bragg Microcavities as optofluidic label-free refractive index sensor, Sensors and Actuators B: Chemical https://doi.org/10.1016/j.snb.2017.10.060

SNB-D-17-02603 REVISED

Robust polarization active nanostructured 1D Bragg Microcavities as optofluidic label-free refractive index sensor

M. Oliva-Ramírez[a,1]*, J. Gil-Rostra[a], F. Yubero[a] and A. R. González-Elipe[a]*.

[a]Instituto de Ciencia de Materiales de Sevilla (CSIC-Univ. Sevilla). Avda. Américo Vespucio 149. 41092 Sevilla. Spain.

*Corresponding authors: manuel.oliva@icmse.csic.es; arge@icmse.csic.es.

Present address
[1]Leibniz Institute for New Materials. Campus D2 2, PC: 66123 Saarbrücken, Germany.

Highlights

- 1.- Planar and highly porous Bragg Microcavities act as refractive index transducers for analytical purposes.
- 2.- Measurements can be carried out in transmission and reflection geometries.
- 3.- A new detection method for polarization active nanostructured materials is proposed.
- 4.- The nanostructured transducer can measure with similar accuracy from relatively low up to high ranges of concentrations.

Abstract:

In this work we report the use of polarization active porous 1D Bragg microcavities (BM) prepared by physical vapor deposition at oblique angles for the optofluidic analysis of liquid solutions. These photonic structures consist of a series of stacked highly porous layers of two materials with different refractive indices and high birefringence. Their operational principle implies filling the pores with the analyzed liquid while monitoring with linearly polarized light the associated changes in optical response as a function of the solution refractive index. The response of both polarization active and inactive BMs as optofluidic sensors for the determination of glucose concentration in water solutions has been systematically compared. Different methods of detection, including monitoring the BM wave retarder behavior, are critically compared for both low and high glucose concentrations. Data are taken in transmission and reflection modes and different options explored to prove the incorporation of these nanostructured transducers into microfluidic systems and/or onto the tip of an optical fiber. This analysis has proven the advantages of the polarization active transducer sensors for the optofluidic analysis of liquids and their robustness even in the presence of light source instabilities or misalignments of the optical system used for detection.