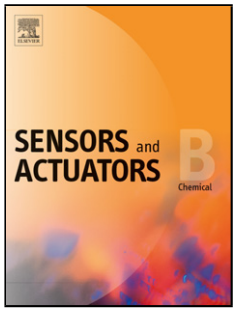

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Authors: Sudeshna Bagchi, Rashmi Achla, Samir K. Mondal

PII: S0925-4005(17)30755-4
DOI: http://dx.doi.org/doi:10.1016/j.snb.2017.04.146
Reference: SNB 22234

To appear in: *Sensors and Actuators B*

Received date: 21-11-2016
Revised date: 21-4-2017
Accepted date: 24-4-2017

Please cite this article as: Sudeshna Bagchi, Rashmi Achla, Samir K.Mondal, Electrospun polypyrrole-polyethylene oxide coated optical fiber sensor probe for detection of volatile compounds, Sensors and Actuators B: Chemicalhttp://dx.doi.org/10.1016/j.snb.2017.04.146

Electrospun polypyrrole-polyethylene oxide coated optical fiber sensor probe for detection of volatile compounds

Sudeshna Bagchi[1,2], Rashmi Achla[1,2] and Samir K Mondal[1,2]
[1]Academyof Scientific and Innovative Research, New Delhi
[2]CSIR-Central Scientific Instruments Organisation, Chandigarh

E-mail: sudeshna_bagchi@csio.res.in

Highlights

- Fabrication of polypyrrole-polyethylene oxide coated fiber optic sensor using two-step approach of electrospinning and vapour phase polymerization.
- Investigation of optical sensor probe for detection of ammonia, triethylamine, methanol, ethanol and acetone vapours.
- The effective refractive index of the fiber cladding changes in the presence of different volatile compounds, modulating the transmitted intensity spectrum.
- Sensor shows high sensing performance towards ammonia, triethylamine, methanol and ethanol

Abstract

In this work, a multimode optical fiber sensor probe coated with polypyrrole-polyethylene oxide (PPO) nanofibrous mat is investigated to detect volatile compounds such as ammonia, triethylamine, methanol, ethanol and acetone vapours. The fibrous mat on the fiber cladding is deposited using electrospinning method followed by vapour phase polymerization. The affinity of PPO towards different volatile compounds changes the effective refractive index of optical fiber cladding, modulating the intensity of the transmitted spectrum. The intensity variation in presence of volatile vapours of different concentration is investigated to determine the responses of the sensor probe. The sensor probe shows different detection limit such as 0.1ppm, 2ppm, 2ppm, and 1ppm and recovery time of 10minutes, 54.4s, 21.06s and 11.08s for ammonia, ethanol, methanol and triethylamine vapours respectively. Thus, the electrospinning technique can be used for coating optical fiber cladding with special material such as PPO to develop optical fiber based sensor to detect trace amount of volatile compound.

Keywords: conducting polymer, complex refractive index, optical fiber, gas sensor