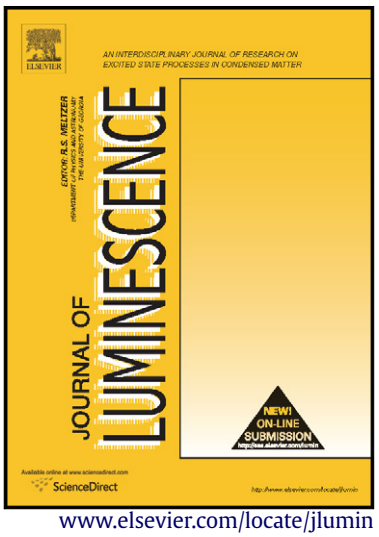

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Highly sensitive fiber-optic oxygen sensor based on palladium tetrakis(4-carboxyphenyl)porphyrin doped in ormosil

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Abstract

A simple, low-cost technique for fabrication of highly sensitive fiber-optic oxygen sensor is described. An organically modified silicate (ORMOSIL) as a matrix for the fabrication of oxygen sensing film was produced. The technique is based on coating the end of a plastic optical fiber with ormosil composite xerogel film sequestered with luminophore palladium (II) meso-tetra(4-carboxyphenyl)porphyrin (PdTCPP) prepared by a sol-gel process. The composite xerogel studied is tetraethylorthosilane (TEOS)/n-octyltriethoxysilane (Octyl-triEOS). Result shows that, expect for PdTCPP-doped TEOS/Octyl-triEOS composite xerogel show the high sensitivity and linear Stern-Volmer relationship which indicate the homogenous environment of the luminophore. The sensitivity of the optical oxygen sensor is quantified in terms of the ratio I_{N2}/I_{O2}, where I_{N2} and I_{O2} represent the detected fluorescence intensities in pure nitrogen and pure oxygen environments, respectively. The experimental result reveals that the PdTCPP-doped TEOS/Octyl-triEOS oxygen sensor has sensitivity of 153.

Keywords: oxygen sensor, plastic optical fiber, sol-gel, PdTCPP.

Highlights

► A simple, low-cost technique for fabrication of highly sensitive fiber-optic oxygen sensor is described.

► ORMOSIL was produced to serve as a matrix for the fabrication of oxygen sensing film.

► The fiber-optic oxygen sensor has sensitivity of I_{N2}/I_{100O2}=153.

►The stable and reproducible signals were obtained with the fiber-optic oxygen sensor.