

Fiber-Optic Sensors for Hydrogen Peroxide Vapor Measurement

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Abstract : This paper reports on the response of a fiber-optic sensing probe to small concentrations of hydrogen peroxide (H₂O₂) vapor at room temperature. H₂O₂ has extensive applications in industrial and medical environments. Conversely, H₂O₂ can be a health hazard by itself. For example, H₂O₂ induces cellular damage in human cells and its presence can be used to diagnose illnesses such as asthma and human breast cancer. Hence, development of reliable H₂O₂ sensor is of vital importance to detect and measure this species. Ferric ferrocyanide, referred to as Prussian blue (PB), was deposited on the tip of a multimode optical fiber through the single source precursor technique and served as an indicator of H₂O₂ in a spectroscopic manner. Sensing tests were performed in H₂O₂-H₂O vapor mixtures with different concentrations of H₂O₂. The results of sensing tests show the sensor is able to detect H₂O₂ concentrations in the range of 50.6 ppm to 229.5 ppm. Furthermore, the sensor response to H₂O₂ concentrations is linear in a log-log scale with the adjacent R-square of 0.93. This sensing behavior allows us to detect and quantify the concentration of H₂O₂ in the vapor phase.

Keywords : chemical deposition, fiber-optic sensor, hydrogen peroxide vapor, prussian blue

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