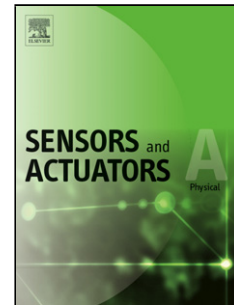


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Development of a Novel Ozone Gas Sensor Based on Sol-Gel Fabricated Photonic Crystal

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Abstract

We have developed a novel ozone gas sensor based on one dimensional photonic crystal with two defects. In this platform, the gas is dissolved in a specific neutral buffer kalium iodide reagent to include the Beer Lambert effect. The corresponding photonic crystal which was fabricated by using sol-gel method consists of a high refractive index layer of TiO₂ and a low refractive index layer of SiO₂. Prior to the fabrication of corresponding photonic crystal, we grew the TiO₂ and SiO₂ single layer separately in order to ensure that the performance of each layer fulfilled the required characteristics provided by our simulation. After that, the fabrication processed was conducted layer-by-layer and inspected by spectrophotometer. The performance test of the fabricated photonic crystal, including its validation, accuracy and sensitivity, was then conducted through spectroscopic treatment and we used ozonizer as the gas source. Validation test was performed by comparing the results with measurement using NBKI method and showed a good agreement. It was found that the accuracy value is up to 98.75%. Based on a statistical approach, we found that the limit of detection is 1.067 $\mu\text{g}/\text{m}^3$ ambient air.

Keywords: ozone gas, photonic crystal sensor, sol-gel method, Beer-Lambert effect.

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