H2 gas sensor based on Pd/ZnO nanostructures deposited on tapered optical fiber

ABSTRACT

A novel H 2 sensor using tapered optical fiber coated with Pd/ZnO nanostructures have been developed. The ZnO nanostructures was synthesized and deposited onto tapered optical fiber via chemical bath deposition (CBD) method. The ZnO was characterized by FESEM, XRD and EDX to confirm the material properties. It was discovered that the sensor is sensitive towards different concentrations of H 2 in synthetic air at 180° C of operating temperature. By varying the deposition time of ZnO coating, different thickness of ZnO layer can be obtained. It was observed that with 280 nm thickness, the maximum absorbance response can be achieved. Further investigation with sensor sample of as-prepared and annealed was carried out to study its sensing performance towards H 2 . The absorbance response of 280 nm thickness of annealed Pd/ZnO has increased 64% as compared to as-prepared Pd/ZnO upon 1% H 2 exposure in the synthetic air when measured in the visible to near infra-red optical wavelength. It can be concluded that the Pd/ZnO optical fiber sensor with thickness around 280 nm provided better sensitivity in sensing H 2 at 180°C as compared to other thicknesses investigated.

Keyword: Optical sensors; Sensing material; Zinc oxide