A hydrogen gas sensor based on TiO2 nanoparticles on alumina substrate

ABSTRACT

High demand of semiconductor gas sensor works at low operating temperature to as low as 100 °C has led to the fabrication of gas sensor based on TiO2 nanoparticles. A sensing film of gas sensor was prepared by mixing the sensing material, TiO2 (P25) and glass powder, and B2O3 with organic binder. The sensing film was annealed at temperature of 500 °C in 30 min. The morphological and structural properties of the sensing film were characterized by field emission scanning electron microscopy (FESEM), energy-dispersive X-ray spectroscopy (EDX) and X-ray diffraction (XRD). The gas sensor was exposed to hydrogen with concentration of 100–1000 ppm and was tested at different operating temperatures which are 100 °C, 200 °C, and 300 °C to find the optimum operating temperature for producing the highest sensitivity. The gas sensor exhibited p-type conductivity based on decreased current when exposed to hydrogen. The gas sensor showed capability in sensing low concentration of hydrogen to as low as 100 ppm at 100 °C.

Keyword: Gas sensor; TiO2-B2O3; Hydrogen; Nanoparticles; p-type TiO2