

## **A hydrogen gas sensor based on TiO<sub>2</sub> 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 TiO<sub>2</sub> nanoparticles. A sensing film of gas sensor was prepared by mixing the sensing material, TiO<sub>2</sub> (P25) and glass powder, and B<sub>2</sub>O<sub>3</sub> 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; TiO<sub>2</sub>-B<sub>2</sub>O<sub>3</sub>; Hydrogen; Nanoparticles; p-type TiO<sub>2</sub>