

## **Influence of B<sub>2</sub>O<sub>3</sub> addition on the properties of TiO<sub>2</sub> thick film at various annealing temperatures for hydrogen sensing**

### **ABSTRACT**

To increase the adhesion of thick film on a substrate, boron oxide (B<sub>2</sub>O<sub>3</sub>) was added to titanium dioxide (TiO<sub>2</sub>), and the change in the morphology, crystallinity and band gap of TiO<sub>2</sub> thick film was investigated. TiO<sub>2</sub> and TiO<sub>2</sub>-B<sub>2</sub>O<sub>3</sub> pastes were prepared and deposited on the microscopic glass using screen-printing technique and then annealed under air at different temperatures of 400°C, 450°C and 500°C for 30 min. The morphology, elemental composition, structure and absorption of the thick films were characterized using FESEM, EDX, XRD and UV–visible spectroscopy. The TiO<sub>2</sub> and TiO<sub>2</sub>-B<sub>2</sub>O<sub>3</sub> thick films were fabricated as gas sensors and exposed to 100–1000 ppm of hydrogen at an operating temperature of 300°C. The results revealed that the addition of B<sub>2</sub>O<sub>3</sub> increased the crystallinity of anatase phases and rutile phases in TiO<sub>2</sub> as annealing temperature increased. The TiO<sub>2</sub>-B<sub>2</sub>O<sub>3</sub>(T500) gas sensor exhibited the highest response to various concentrations of hydrogen (100–1000 ppm) at an operating temperature of 300°C.

**Keyword:** TiO<sub>2</sub>-B<sub>2</sub>O<sub>3</sub>; Screen printing; Thick film; Hydrogen gas sensor; Adhesion