

**COMPARATIVE STUDIES ON MICROSTRUCTURAL AND GAS SENSING PERFORMANCE OF TiO<sub>2</sub> AND TiO<sub>2</sub>-PANi NANOCOMPOSITE THIN FILMS.**

Mohammad Hafizuddin Haji Jumali<sup>1</sup>, Izura Izzuddin<sup>1</sup>, Norhashimah Ramli<sup>1</sup>,  
Muhamad Mat Salleh<sup>2</sup> and Muhammad Yahaya<sup>1</sup>.

<sup>1</sup>*School of Applied Physics, Faculty of Science and Technology,*  
<sup>2</sup>*Institute of Microengineering and Nanoelectronic (IMEN),*  
*Universiti Kebangsaan Malaysia (UKM), 43600 Bangi, Selangor, MALAYSIA*

**ABSTRACT**

In recent years, the development of inorganic-organic hybrid materials has grown due to better properties and wide range of potential use. The aim of this research is to investigate the effect of PANi addition on VOC gas sensing properties and microstructures of TiO<sub>2</sub> based thin films. TiO<sub>2</sub> ceramics were prepared via sol-gel technique. PANi, in amount of 3wt% was added to TiO<sub>2</sub> sol to produce TiO<sub>2</sub>-PANi solution. Then TiO<sub>2</sub> and TiO<sub>2</sub>-PANi solutions were deposited onto SiO<sub>2</sub> coated silicon substrate using spin coating technique for fabrication of gas sensing device. XRD investigation showed that the thin films were amorphous. TEM study of the TiO<sub>2</sub> and TiO<sub>2</sub>-PANi powders revealed a significant reduction of TiO<sub>2</sub> particles size from 10nm to 2nm with the addition of PANi. SEM micrographs showed that both films exhibit an open porous structure with TiO<sub>2</sub> rich grain particles well distributed on the substrate. The gas sensing devices were exposed towards VOCs vapours. It was found that the device with addition 3wt% of PANi exhibit a systematic response towards ethanol and methanol vapour exposure at room temperature. In contrast TiO<sub>2</sub> thin film did not show any response due to low operating temperature.

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Corresponding Author: hafizhj@ukm.my