اونيۏرسيتي تيكنولوݢي مارا
UNIVERSITI TEKNOLOGI MARA

Institut Pengajian Siswazah

THE DOCTORAL RESEARCH ABSTRACTS

Volume: 14, October 2018

14th ISSUE

IGS Biannual Publication

70

Name : RUZIANA BINTI MOHAMED

Title : ETHANOL SENSING BEHAVIOUR OF TIN DOPED ZINC OXIDE/TIN OXIDE COMPOSITED NANOROD ARRAYS ON MAGNESIUM-ALUMINIUM CO-DOPED ZINC OXIDE SEEDED LAYER

Supervisor : DR. MOHAMAD HAFIZ MAMAT (MS)
PROF. ENGR. DR. MOHAMAD RUSOP MAHMOOD (CS)
DR. ZURAIDA KHUSAIMI (CS)

The ethanol sensor device fabrication was carried out using undoped zinc oxide nanorod (ZnO NR) arrays, tin doped zinc oxide nanorod (Sn:ZnO NR) arrays and novel nanostructured tin doped zinc oxide/ tin oxide nanorod (Sn: ZnO/SnO2 NR) arrays film. The sensor consists of a thin film nanostructured deposited on the novel seed layer magnesium-aluminium co-doped zinc oxide (MAZO) coated glass using solution immersion technique. The thin film nanostructures were investigated using X-ray diffraction analysis, energy-dispersive X-ray spectroscopy, field emission scanning electron microsopy, atomic force microscopy, photoluminescence spectrometry, ultraviolet-visible-near-infrared spectrometry, thickness profilometry and two-probe current-voltage measurement system. The sensor performance was analysed based on the change in electrical conductivity upon gas adsorption when ethanol gas was exposed to nanorod arrays film that act as sensing materials. The growth of ZnO NR arrays film was influenced by many factors. In this study, some parameters have been done for ethanol sensor application such as doping process (undoped, single doped and co-doped ZnO seed layer), the variation of coating seed layers (one to nine coating layers), the effect of ZnO NR arrays growth on variation coating layers (one to nine coating layers), the effect of ZnO NR arrays growth at different immersion time (15-90 min), the effect of doping process for ZnO NR arrays (undoped and Sn doped) and the effect of pH of SnO2 solution to the growth of Sn:ZnO/SnO2 NR arrays. The conductometric sensor system was set up to study the sensing sensitivity, response and recovery time and selectivity properties towards ethanol gas. The sensor response for Sn:ZnO/SnO2 NR arrays was 20. It was observed that the Sn:ZnO/SnO2 NR arrays film showed the highest response to the presence of ethanol gas compared ZnO and Sn: ZnO NR arrays. The Sn:ZnO/SnO2 NR arrays showed the shorter of response and recovery time which was around 81 and 63 s, respectively. The sensing sensitivity of Sn:ZnO/SnO2 NR arrays prepared at pH 5.5 of SnO2 solution was increased from 2.4 to 5.2 with an increase of ethanol concentration range 60 to 300 ppm. The Sn:ZnO/SnO2 NR arrays prepared at pH 5.5 of SnO2 solution also showed the increasing of sensing sensitivity value range 2.5 to 8.0 when the working temperature is increased from 60 to 140^{o}C. It also was observed that the Sn:ZnO/SnO2 NR arrays have good selectivity properties towards ehanol vapor as compared to acetone and propanol vapor.