Sensors & Transducers Journal, Vol. 134, Issue 11, November 2011, pp. 32-44

www.sensorsportal.com

Sensors & Transducers

ISSN 1726-5479

http://www.sensorsportal.com

Fabrication of Phenyl-Hydrazine Chemical Sensor Based on Al- doped ZnO Nanoparticles

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Received: 17 June 2011 /Accepted: 21 November 2011 /Published: 29 November 2011

Abstract: Here, an important attempt has been employed for the development and applications of Al doped ZnO (Al.ZnO) nanoparticles using hydrothermal method at room conditions. The structural, optical, and chemical properties of the low-dimensional (average diameter, 64.0±10.0 nm) doped Al.ZnO nanoparticles were exemplified using various techniques such as UV/visible, FT-IR, Raman spectroscopy, x-ray powder diffraction (XRD), and Field-emission scanning electron microscopy (FE-SEM) etc. Al.ZnO is an interesting doped nanoparticles for implementation in chemical sensing by reliable I-V method, where hazardous chemical (phenyl hydrazine, PhHyd) is used as a target chemical. The sensor performances are investigated using Al.ZnO nanoparticles embedded onto silver electrodes (AgE, active surface area, 0.0216 cm^2), which shows the sensitivity, stability, and reproducibility of the sensor improved significantly. In analytical investigation, the calibration plot is linear over the large concentration range (10.0 μM to 0.05M), where the sensitivity is 1.1432 ± 0.10 $\mu Acm^{-2}mM^{-1}$ with a detection limit (LOD) of 1.215 ± 0.02 μM based on signal to noise ratio in short response time. Therefore, it is concluded that the morphologies and the optical features can be implemented to large-scale in transition-metal-doped semiconductor nano-materials as well as efficient chemical sensors. *Copyright © 2011 IFSA.*

Keywords: Al doped ZnO, Hydrothermal method, Powder X-ray diffraction, Phenyl-hydrazine sensor, I-V method, Sensitivity.