proceedings

MDPI

Extended Abstract

Sensing Performance of Al and Sn Doped ZnO for Hydrogen Detection †

Zahira. El khalidi [1,4,*], Bouchaib. Hartiti [1,4], Maryam Siadat [2], Elisabetta. Comini [3], Salah. Fadili [4] and Philippe. Thevenin [2]

[1] Senior Assoc. ICTP-UNESCO-IAEA, 34100 Trieste, Italy; Bhartiti@gmail.com
[2] LMOPS Laboratory, University of Lorraine, 57000 Metz, France; maryam.siadat@univ-lorraine.fr (M.S.); philippe.thevenin@univ-lorraine.fr (P.T.)
[3] Dipartimento di Ingegneria Dell'informazione, Universita Digli Studi di Brescia, 25100 Brescia, Italy; elisabetta.comini@unibs.it
[4] MAC & PM Laboratory, FST Mohammedia, Hassan II Casablanca University, 20430 Casablanca, Morocco; safadili@yahoo.fr
* Correspondence: elkhalidizahira@gmail.com; Tel.: +212-663-130-999
† Presented at the 8th GOSPEL Workshop. Gas Sensors Based on Semiconducting Metal Oxides: Basic Understanding & Application Fields, Ferrara, Italy, 20–21 June 2019.

Published: 19 June 2019

Abstract: Chemical gas sensors were studied long ago and nowadays, for the advantageous role they provide to the environment, health condition monitoring and protection. The recent studies focus on the semiconductors sensing abilities, especially of non toxic and low cost compounds. The present work describes the steps to elaborate and perform a chemical sensor using intrinsic and doped semiconductor zinc oxide. First, we synthesized pure oxide using zinc powder, then, two other samples were established where we introduced the same doping percentage of Al and Sn respectively. Using low cost spray pyrolysis, and respecting the same conditions of preparation. The obtained samples were then characterized by X Ray Diffraction (XRD) that revealed the hexagonal wurzite structure and higher crystallite density towards the direction (002), besides the appearance of the vibration modes related to zinc oxide, confirmed by Raman spectroscopy. SEM spectroscopy showed that the surface morphology is ideal for oxidizing/reduction reactions, due to the porous structure and the low grain sizes, especially observed for the sample Sn doped ZnO. The gas testing confirms these predictions showing that the highest response is related to Sn doped ZnO compared to ZnO and followed by Al doped ZnO. The films exhibited responses towards: CO, acetone, methanol, H_2, ammonia and NO_2. The concentrations were varied from 10 to 500 ppm and the working temperatures from 250 to 500°C, the optimal working temperatures were 350 and 400 °C. Sn doped ZnO showed a high response towards H_2 gas target, with a sensitivity reaching 200 at 500 ppm, for 400 °C.

Keywords: binary materials; Sn and Al doped ZnO; porous surface; gas sensors; H_2

Conflicts of Interest: The authors declare no conflict of interest.