

Hydrogen sensing response of platinum doped zinc oxide

Anita Hastir *, Nipin Kohli, Ravi Chand Singh

Department of Physics, Guru Nanak Dev University, Amritsar-143005, India.

*Email: nipinkohli82@yahoo.com

Abstract: Hydrogen gas is extensively used as a clean fuel for space applications, industrial processes, metallurgical processes, nuclear reactors, power generation, etc. Being highly inflammable its usage at concentrations in excess of 4% vol. in ambient air can lead to explosion risks. Since it is a colourless and odourless gas therefore its leakage detection by human senses is not possible. Thus the hydrogen sensor is of utmost importance in order to detect its early leakage. Semiconductor metal oxides (SMO) have been extensively used in the application of gas sensing because of the low cost, high sensitivity and low power consumption.

In this work, the effect of Platinum (Pt) as dopant on the structural, morphological and gas sensing properties of ZnO has been discussed. ZnO and Pt doped ZnO nanoparticles were synthesized by facile and cost effective co-precipitation technique. XRD analysis revealed the formation of hexagonal wurtzite structure for pure and doped nanostructures which was further supported by Raman studies. Raman and X-Ray photoelectron spectroscopy (XPS) investigations also reveal the presence of defects in doped samples. The morphology of the synthesised samples has been studied by field emission scanning electron microscopy (FESEM). For gas sensing characteristics the synthesised particles were applied as thick film onto an alumina substrate and tested at different operating temperatures for hydrogen gas. Among all samples, 0.05% Pt doped ZnO exhibited enhanced sensing performance towards hydrogen. The increase in sensing response is attributed to presence of defects in doped sample and the catalytic nature of platinum.

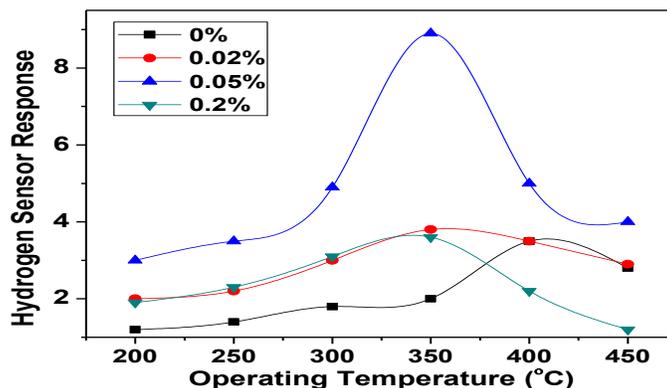


Figure: Variation of H₂ sensor response of (a) pure, (b) 0.02% Pt doped, (c) 0.05% Pt doped, and (d) 0.2 % Pt doped ZnO with operating temperature.

References:

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