

Nanotech 2018: Design and Fabrication of ZSO nanocomposite thin film based NO₂ gas sensor- Bal Chandra Yadav, Rakesh K Sonker, Anjali Sharma, Punit Tyagi, Vinay Gupta and Monika Tomar, Babasaheb Bhimrao Ambedkar University

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ZnO doped SnO₂ thin films of various compositions were deposited on the surface of a corning substrate by dropping the two sols containing the precursors for composite (ZSO) with subsequent heat treatment. The sensor materials used for selective detection of nitrogen dioxide (NO₂) were designed from the correlation between the sensor composition and gas response. The available NO₂ sensors are operative at a very high temperature (150-800°C) with low sensing response (2-100) even in higher concentrations. Efforts are continuing towards the development of NO₂ gas sensor aiming with an enhanced response along with a reduction in operating temperature by incorporating some catalysts or dopants. Thus in this work, a novel sensor structure based on ZSO nanocomposite has been fabricated using the chemical route for the detection of NO₂ gas. The structural, surface

morphological and optical properties of prepared films have been studied by using X-ray diffraction (XRD), Atomic force microscopy (AFM), Transmission electron microscope (TEM) and UV-visible spectroscopy respectively. The effect of thickness variation from 230nm to 644nm of ZSO composite thin film has been studied and the ZSO thin film of thickness ~460nm was found to exhibit the maximum gas sensing response $\sim 2.1 \times 10^3$ towards 20ppm NO₂ gas at an operating temperature of 90°C. The average response and recovery times of the sensor were observed to be 3.51 and 6.91 min respectively. Selectivity of the sensor was checked with the cross-exposure of vapour CO, acetone, IPA, CH₄, NH₃, and CO₂ gases. It was found that besides the higher sensing response towards NO₂ gas, the prepared ZSO thin film was also highly selective towards NO₂ gas.