Structural, Optical and Solid State Properties of WO_3 Nanostructured Thin Film for Optical Gas Sensing using Chemical Bath Deposition Technique

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Abstract**—**The fast developments in the field of science, especially nanoscience have been the good drivers in the progress of sensor technologies and educational transformation in the mechanical engineering sectors**.** Tungsten Oxide (WO_3) Nanostructured thin films were successfully developed on glass substrates using chemical bath deposition method at a temperature of 300K. The sources of W^+ are $Na_2WO_4.2H_2O$ and EDTA. EDTA was used as a complexing agent. WO_3 nanostructured thin film was prepared at the deposition period of 29 hours. The film was characterized for crystal structure using Drawell artist of science. DW-XRD-2700A X-ray diffractometer with a wavelength of 1.5418Å. The crystal structure investigated using XRD analysis reveals that the film is polycrystalline with monoclinic structure. The optical characterization was done using Prolab-U756S UV-Vis Spectrophotometer. The optical characterization of the film reveals that there is no transmittance in UV region but high absorbance and high reflectance observed was absent UV region. High transmittance accompanied with high values of absorbance and reflectance in visible and infrared regions was also observed. The high transmittance property of the film in the visible and infrared regions makes the film transparent and suitable materials for optical gas sensor. The average energy band-gap of WO_3 nanostructured thin film at room temperature of 300K is 2.81eV. The wide energy band gap exhibited by film reveals that the film is suitable material for gas sensors and other optoelectronic device applications.

Keywords**—** Tungsten Oxide, Transmittance, Absorbance, Band Gap, Optical Gas Sensing

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