Study of Photosensing Properties of Cu-ZnO Thin Film grown by Facile Chemical Bath Deposition Method

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**Abstract**. We have successfully deposited Cu-ZnO thin film by using facile and cost-effective chemical bath deposition method at 50 ℃. The structural, optical and electrical properties of the prepared Cu-ZnO thin films have been studied by using X-ray Diffractometer (XRD), UV-Visible spectrophotometer and I-V source meter of Keithley interfaced with class AAA solar simulator respectively. The doping of copper into ZnS lattice has been confirmed with X-ray diffraction pattern. All diffraction peaks has been assigned to the various reflections planes originated from the CuZnO material by comparing it with the standard JCPDS cards (JCPDF # 75-0576 & # 36-1451) having Wurtzite (Hexagonal) phase. The average crystallite size has been estimated by using Scherer formula and found to be ~17.18 nm.1-4 Optical study shows, higher absorbance in the visible region and exponential increase in absorbance from visible region with an absorption edge around ~700 nm which results in the wide band gap of ~2.67 eV.5 The I-V characteristics has been used to study the electrical properties of the Cu-ZnO thin film in the applied voltage range of ±2 V in dark and under illumination of 100 Watt light. The straight line curve passing through origin has been observed for both in dark and under light illumination which exhibits ohmic nature of the film. The I-V curve shows high photocurrent which is attributed to the charge carrier generation after photon illumination. The photosensitivity has been calculated at 2 V bias voltage and found to be ~78.5 %. The electrical properties has revealed its potential application in optoelectronic devices.6, 7

References:

1. R. A. Zargar, M. Arora, M. Ahmad, and A. K. Hafiz, Journal of Materials **2015**, 6 (2015).
2. C. Zhou, L. Xu, J. Song, R. Xing, S. Xu, D. Liu and H. Song, Scientific Reports **4**, 7382 (2014).
3. G. M. M. Gubari, I. M. S. M., N. P. Huse, A. S. Dive and R. Sharma, AIP Conference Proceedings **1953** (1), 100072 (2018).
4. D. Gao, Y. Xu, Z. Zhang, H. Gao and D. Xue, Journal of Applied Physics **105** (6), 063903 (2009).
5. A. Modwi, M. A. Ghanem, A. M. Al-Mayouf and A. Houas, Journal of Molecular Structure **1173**, 1-6 (2018).
6. N. Huse, D. Upadhye and R. Sharma, AIP Conference Proceedings **1728** (1), 020410 (2016).
7. S. V. Mahajan, D. S. Upadhye, S. U. Shaikh, R. B. Birajadar, F. Y. Siddiqui, S. B. Bagul, N. P. Huse and R. B. Sharma, AIP Conference Proceedings **1665** (1), 080063 (2015).