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Impacts Of Moringa Oleifera Leaf Extracts On The Structural And Optical Properties Of Chemically Deposited Sb_2S_3 Thin Films

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In this letter, the research design was by the experimental method. Thin films of antimony sulphide (Sb_2S_3) were grown on glass substrate using the chemical bath deposition method. The films were grown at varying concentrations of 0.1 M to 0.3 M while other deposition variables were fixed. A 4g/L of the moringa oleifera leaf extract was used as a dopant at the respective concentrations. Post-deposition heat treatments of the films was done using annealing temperatures ≤ 473 K for 60 mins. The structural properties of the films were investigated using X-ray diffractometry to study the crystalline structure and phases contained in the films. The transmittance, reflectance and absorbance with wavelength measurements in the UV-VIS region was done with the UV-spectrophotometry. Results of the structural analysis show that the grain size of the films increased with an increase in concentration (14.85nm, 22.45 nm, and 35.33 nm) in the doped films. The values of the grain sizes obtained in this work are in agreement with the reports of the research work by Wang et al., (2016) and Yuan et al (2016) respectively, in related chalcogenide thin films. The optical analysis indicates that the annealing treatments influenced the optical properties of the as-grown films to vary in one direction while the doped films varied in the reverse direction. Similar trend has been reported by other authors in the literature (Chalapathi, Poornaprakash and Park, 2017). The transmittances of the doped films were higher compared to that of the as-grown films (Nwofe and Mutsumi, 2020). The energy bandgap of the exhibited a blue shift effect in the wavelength with an increase in the concentration of the Sb^+ ions (Krishnan, Shaji and Ornelas, 2015). The films show optical absorption coefficient > 10^4 cm^{-1} independent of the growth conditions (Rahaman et al., 2022). The value of the energy band gap falls within acceptable range for application in photovoltaic devices. To the best of our knowledge, this is letter is a pioneering report on the impact of extracts of moringa oleifera leaf extracts on the material properties of antimony sulphide thin films.

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