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Effect of zinc acetate concentrations on the structure, morphology and optical properties of ZnO nanoflakes synthesized by chemical bath deposition method

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Abstract :

FV Molefe, LFKoao, JJ Dolo, BFDejene Department of Physics, University of the Free State (QwaQwa Campus), Private Bag X13, Phuthaditjhaba, 9866, South Africa Corresponding Author Email address: koaolf@qwa.ufs.ac.za Zinc Oxide (ZnO) nanostructures were synthesized by chemical bath deposition method (CBD) from precursors containing varying molar concentrations of zinc acetate. The structure, morphology, optical and luminescence properties of the samples were investigated using X-ray diffraction (XRD), Scanning electron microscopy (SEM), ultraviolet spectroscopy (UV) and Photoluminescence (PL). The XRD result shows that at low molar concentrations of zinc acetate the structure is modified cubic ZnO. As the molar concentration of zinc acetate increases the well-known hexagonal wurtzite structure of ZnO is developed. The average particle size estimated using Scherer's formula was about 37 nm. It was found that the average particle size increases with an increase in the molar concentration of zinc acetate. SEM observations showed the presence of nanocrystallites forming aggregated nanoflakes. The morphology was found to be dependent on the concentration of zinc acetate. The UV-Vis spectra showed that the absorption band edge shifts to the higher wavelength with an increase in molar concentration of zinc acetate. The band gap energy of ZnO nanostructures determined from UV reflectance spectra was found to decrease from 3.23 to 2.75 eV with an increase in the zinc acetate concentration. The PL results show that the luminescence intensities decrease with an increase in the molar concentration of zinc acetate. The maximum luminescence band was found around 464 nm without any significant shift in position.

Award :

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Paper :

Yes

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