STRUCTURAL, MORPHOLOGICAL AND OPTICAL CHARACTERIZATIONS OF ANNEALED EDTA CAPPED ZNS NANOCRYSTALS PREPARED BY CHEMICAL PRECIPITATION METHOD


Abstract:

ZnS nanocrystals were prepared by the chemical co-precipitation method. The effect of annealing temperature (Ta) on the morphological, structural and optical absorption behavior was investigated using x-ray diffraction (XRD), high resolution transmission electron microscope (HRTEM), UV-vis spectroscopy, selected area electron diffraction (SAED) and Fourier transform infrared (FTIR) spectroscopy. Analysis of XRD patterns for as prepared and annealed samples showed that, increasing Ta leads to an increase in the crystallite size (D) from 2.67 to 19.6 nm. It is noticed that the obtained values of lattice parameters from HRTEM Images and SAED patterns are in good agreement with that deduced from XRD analysis. Furthermore, annealing process at 600 °C and 700 °C results, in complete phase transformation from as prepared ZnS cubic structure to ZnO hexagonal structure. Analysis of the XRD patterns, SAED, HRTEM and FTIR confirm this phase transition. Analysis of the optical absorption spectra indicates noticeable decrease in the direct band gap from 4.70 to 3.22 eV with increasing Ta. This behavior is attributed to the enhancement in crystallinity and the increase in particle size of ZnS nanoparticles. Moreover, UV photo-induced effect on the optical absorption edge was studied.

Keywords:

annealing and UV induced effects, morphology, nanostructure, ZnS phase transition, optical absorption behavior

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