Thermal annealing and UV irradiation effects on structure, morphology, photoluminescence and optical absorption spectra of EDTA-capped ZnS nanoparticles

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Abstract:

Monodispersed ZnS nanoparticles (NPs) were prepared by the chemical precipitation method. Thermally induced structural, morphological and optical changes have been investigated using x-ray diffraction, high-resolution transmission electron microscopy, optical absorption, photoluminescence (PL), and Fourier transform infrared and Raman spectroscopy. It was found that D increases with increasing annealing temperature (T a). The onset of the ZnS phase transition from cubic to hexagonal structure takes place at 400 °C, while cubic ZnS transforms into hexagonal ZnO via thermal oxidation in air at 600 °C. It is also noted that increasing T a results in the red shift of the optical band gap (E g ) and the thermal bleaching of exciton absorption. The PL spectrum of as-prepared ZnS nanopowder shows UV emission bands at 363 and 395 nm and blue and green emission at 438 and 515 nm, respectively. With increasing T a up to 500 °C, these bands were quenched and red-shifted. In addition, the UV irradiation effects on colloidal ZnS NPs were investigated. UV irradiation at a dose

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