Optical properties of CdS/PVA nanocomposite films synthesized using the gamma-irradiation-induced method

ABSTRACT

Monodispersed spherical CdS nanoparticles embedded into polyvinyl alcohol (PVA) films are synthesized by using an in-situ gamma-irradiation-induced method. The formation mechanism of CdS nanoparticles capped by two united cells of PVA is purposed by means of surrounding the CdS nanoparticles with OH bonds of the PVA chain. CdS nanoparticles are found to possess an unusual orthorhombic structure in monoclinic crystalline PVA. The polymer matrix affords protection from agglomeration and controls the particle size. It is found that the distribution of the prepared nanoparticles increases and a narrower size distribution is observed when the gamma radiation is varied from 10 to 50 kGy. While the average size of the nanoparticles is found to be less affected by the variation of the gamma radiation doses. The size range of the synthesized nanoparticles is 14±1 nm. The optical absorption spectra of synthesized CdS nanoparticles in a polymer matrix reveal the blue shift in the band gap energy with respect to CdS bulk materials owing to quantum confinement effect. The photoluminescence study of nanocomposite films shows the green emission arising from the crystalline defects.

Keyword: Optical properties; CdS/PVA nanocomposite; Gamma irradiation method