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A study of structural, morphological and optical properties of nanostructured ZnSe/ZnS multilayer thin films

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Abstract

Nanostructured ZnSe/ZnS multilayer thin films with excellent blue light emission were prepared using the electron beam evaporation technique. The structures and crystallization of the nanostructured ZnSe/ZnS multilayer thin films were studied by X-ray diffraction, which revealed a good crystallization with cubic structure of ZnSe and wurtzite structure of ZnS. The surface and inner morphologies of these films were analyzed by the Scanning Electron Microscopic and Transmission Electron Microscope, respectively. Optical transmission spectra were also investigated by UV–vis–NIR scanning spectrophotometer. Furthermore, the blue emission spectra of annealed films locating at about 440 nm were obtained, which corresponded to near band-edge emission of ZnSe. An obvious blue-shift of near band-edge emission was observed with annealing temperature increasing due to the quantum confinement effects. It is full of great potential for the nanostructured films to be used in optoelectronic devices based on outstanding blue luminescence performance.

Keywords: ZnSe, ZnS, Thin films, Nanostructure, Blue luminescence

1 Introduction

In recent years, II–VI semiconductors have attracted considerable attention of researchers because of their excellent electronic and optoelectronic properties, such as wide band gap, high chemical stability,