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The optical properties and energy transition process in nanocomposite of polyvinyl-pyrrolidone polymer and Mn-doped ZnS

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Abstract This study has been carried out on the optical properties of polyvinyl-pyrrolidone (PVP), the energy transition process in nanocomposite of PVP capped ZnS:Mn nanocrystalline and the influence of the PVP concentration on the optical properties of the PVP capped ZnS:Mn nanocrystalline thin films synthesized by the wet chemical method. The microstructures of the samples were investigated by X-ray diffraction, the atomic absorption spectroscopy, and transmission electron microscopy. The results showed that the prepared samples belonged to the sphalerite structure with the average particle size of about 2–3 nm. The optical properties of samples are studied by measuring absorption, photoluminescence (PL) spectra and time-resolved PL spectra in the wavelength range from 200 to 700 nm at 300 K. From data of the absorption spectra, the absorption edge of PVP polymer was found about of 230 nm. The absorption edge of PVP capped ZnS:Mn nanoparticles shifted from 322 to 305 nm when the PVP concentration increases. The luminescence spectra of PVP showed a blue emission with peak maximum at 394 nm. The luminescence spectra of ZnS:Mn–PVP exhibits a blue emission with peak maximum at 437 nm and an orange–yellow emission of ion Mn^{2+} with peak maximum at 600 nm. While the PVP coating did not affect the microstructure of ZnS:Mn nanomaterial, the PL spectra of the PVP capped ZnS:Mn samples were found to be affected strongly by the PVP concentration.

Keywords Nanocomposite · Time-resoled PL spectra · Absorption spectra · PVP

1 Introduction

Despite intensive research on conductivity, local domain orientation and molecular order in organic semiconductor thin films (McNeill 2011), the relationship between morphology,

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