Investigation of the effect of amino-alcohol stabilizers on crystal structure, band gap and blue luminescence of Cu-doped ZnO nanoparticles prepared by sol-gel method

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(Received: 7/4/2020, in revised form: 17/8/2020)

Abstract: In this research, Zn$_{0.97}$Cu$_{0.03}$O nanoparticles are prepared by sol-gel method using various stabilizers (Mono, Di, and Tri-ethanolamine). The effect of stabilizers on the structural, morphological and optical properties of the nanoparticles were investigated. Study of X-ray diffraction pattern shows the hexagonal wurtzite structure of samples. The crystallite size, strain, stress, and deformation energy of the lattice were determined by modified Williamson-Hall relations. The results showed the sample prepared with monoethanolamine has the lowest crystallite size, lattice parameter and strain. FESEM images revealed a decrease in nanoparticle accumulation with increasing amine group. By the change of mono to tri-ethanolamine in the primary sol, the red shift was observed at the near band edge emission of PL spectra which consistent with decrease of optical band gap from 3.16 eV to 3.11 eV deduced from strain enhancement.

Keywords: Cu-doped ZnO; nanoparticles; Sol-Gel; Stabilizer; structural parameters; Band gap; Photoluminescence

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