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Effects of synthesised temperature and solvents on the ZnO properties

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Abstract content
 (Max 300 words)

In this study the material properties of ZnO nanoparticles synthesised at different temperatures (300, 400, 500 and 600 °C) by using different solvents; methanol, ethanol and water are reported. The aim of the study was to observe the influences of various solvents and growth temperatures on the properties of the product ZnO. Different results with respect to the different solvents and various temperatures were obtained. The scanning electron microscopy images presented different sizes and shapes of the ZnO powders obtained at the various temperatures. ZnO nanorods prepared using water as a solvent are thinner as compared to those obtained using ethanol. The ZnO nanorods prepared using ethanol as solvent display more clustered morphology. The sizes for the rods for the ZnO prepared with ethanol and water were determined to be 688 nm and 188 nm. The ethanol prepared ZnO showed clusters of nanorods. The X-ray diffraction (XRD) peaks are indexed as the hexagonal wurtzite structure ZnO (JCPDS 36-1451). The lattice parameters were calculated from the XRD spectra of the ZnO. The photoluminescence of ZnO nanoparticles prepared with the various solvents was compared. The different shifts in emission peaks are shown and the impact of different masses of zinc acetate on the intensity is illustrated. The ZnO prepared with ethanol had strong blue emissions from 424 to 430 nm and the ZnO prepared with water had emission peaks at around 423, 486 and 535 nm. The UV-Vis spectroscopy indicates the absorption edges and also the blue shifts that occurred with an increase in the zinc acetate mass. From the UV-Vis spectra the energy band gap was determined and the effect of the synthesised temperature on the band energy is illustrated. The band gap of ZnO prepared using ethanol and water increased from 4.2 to 4.7 eV with a temperature increase.

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