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Influence of pH value on the material properties of the ZnO nanostructures using various solvents at constant temperature

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Abstract: ZnO nanoparticles were prepared by sol-gel process using various solvents. The sol-gel process is inexpensive, reliable, repeatable and simple. In this paper, we report the role of pH value on the structural and optical properties of ZnO nanoparticles. NaOH was used to vary the pH values of the precursors from 10 to 13.6. It is known that the nanoparticles are highly sensitive to surface environments such as water, moisture, humidity, pH and solvents. The pH affects the hydrolysis and condensation behavior of the solution during gel formation and therefore influences the material properties of the ZnO. SEM micrographs for the ZnO prepared using ethanol and methanol shows the agglomerated spherical ZnO nanoparticles of different sizes that are closely packed. The XRD patterns revealed wurtzite structure with three major peaks corresponding to (100), (002), and (101) planes which are indexed as JCPDS card no. 36-1451. The PL spectra display broad blue emissions that varied in intensity depending on the pH of the solution while peak position never changed. The UV absorption spectra of the ZnO prepared using methanol show a band edge around 248 nm and a weak band at around 282 nm for the pH values from 10.06 to 13.34. It is observed from the band gap spectra that when the pH value is 13.54, the band gap decreases but increases for the pH values between 10.06 and 13.34.

Reference: [1] K. J. Lee, MSc thesis, Texas A&M University, 2005

Summary

N/A

Apply to be considered for a student award (Yes / No)?

No

Level for award (Hons, MSc, PhD, N/A)?

N/A

Main supervisor (name and email) and his / her institution

N/A

Would you like to submit a short paper for the Conference Proceedings (Yes / No)?

yes

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