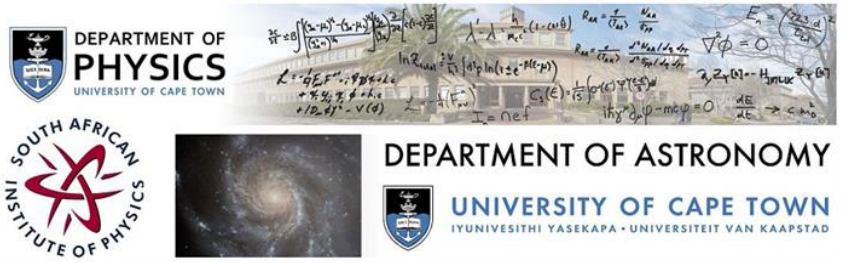

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Effects of doping ratio on structural, luminescence and transmittance properties of Ga–Doped ZnO nanoparticles by precipitation reflux method

Tuesday, 5 July 2016 16:10 (1h 50m)

Abstract content
   (Max 300 words)
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Key words: Semiconductor, Gallium, ZnO, DSSCs

Ga-doped ZnO (ZnO:Ga) nanoparticles were synthesized by precipitation reflux method. The effects of varying [Ga]/[Zn] doping ratios on the morphology, luminescence and optical properties of ZnO:Ga were investigated. Ga-doped ZnO transparent conducting materials have gained much interest in recent years due to their low resistivity, high transmittance, nontoxicity and resource availability [1]. X-ray diffraction (XRD) and scanning electron microscopy (SEM) analyses were performed for the nanoparticles. It was found that SEM images increased in size by increasing the [Ga]/[Zn] ratio up to 2 mol.% then reduced in size at higher doping ratios (3-5 mol.%). The diffraction patterns showed hexagonal wurtzite structure of ZnO. The crystallinity and crystallite sizes increased by increasing doping ratios to 2 mol. %, but decreased as doping ratios increased to 5%. The total reflectance spectra of ZnO:Ga samples are similar and show reflectance of 9–14% in the spectral region of 350 –700 nm. The % transmittance of ZnO:Ga in the UV region, was observed to increase with doping levels then reduce at higher % doping. Similarly, the highest excitonic peak emissions were seen at 2% [Ga]/[Zn] ratio from the PL spectra.

Reference: [1] M. Netrvalova, I. Novotny, L. Prusakova, V. Tvarozek, and P. Sutta, "Influence of deposition regime on physical properties of gallium-doped zinc oxide films," Vacuum, vol. 86, no. 6, pp. 707–710, 2012.

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