

Accepted Manuscript

Title: Effect of NaOH molar concentration on optical and ferroelectric properties of ZnO nanostructures

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PII: S0169-4332(15)01920-0
DOI: <http://dx.doi.org/doi:10.1016/j.apsusc.2015.08.107>
Reference: APSUSC 31054

To appear in: *APSUSC*

Received date: 13-4-2015
Revised date: 4-8-2015
Accepted date: 13-8-2015

Please cite this article as: P. Chand, A. Gaur, A. Kumar, U.K. Gaur, Effect of NaOH molar concentration on optical and ferroelectric properties of ZnO nanostructures, *Applied Surface Science* (2015), <http://dx.doi.org/10.1016/j.apsusc.2015.08.107>

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Effect of NaOH molar concentration on optical and ferroelectric properties of ZnO nanostructures

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Abstract

The present study reports the effects of NaOH concentrations in hydrothermally grown ZnO nanostructures on structural, optical and ferroelectric properties at different selected NaOH molar concentrations (3-7M). X-ray diffraction, Raman and photoluminescence analysis confirms the formation of pure phase of ZnO. FESEM images show that the average grain size of ZnO nanostructures increases from 61 to 95 nm as molar concentration increases from 3 to 7 M, respectively. Transmission electron microscope analysis also reveals that an average grain size of ZnO nanostructures increases from 34 to 55 nm as molarity increases from 3 to 7 M concentrations. A significant reduction in the optical band gap is observed from 4.41- 3.96 eV by increasing molar concentration from 3 to 7 M, respectively. The decrease in the band gap with molar concentration could be due to the increase of density of localize state in the conduction band. Furthermore, ferroelectricity is observed in ZnO nanostructures at room temperature which is interesting and adds an additional dimension to its applications.

Keywords: ZnO nanostructures, FESEM, TEM, PL, Raman spectra, UV-Vis spectrometer, Ferroelectricity.

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