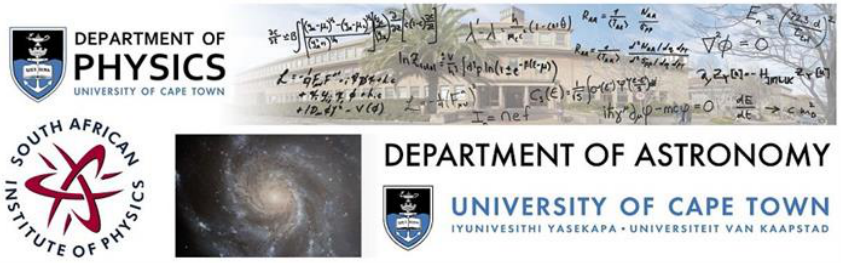

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Effect of Annealing Temperature on Optical and Electrical Properties of ZnO Thin Films Synthesized by Sol-Gel Method

Friday, 8 July 2016 09:40 (20 minutes)

Abstract content
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Zinc oxide (ZnO) is a multifunctional material having unique physical properties as well as chemical and photo stability. Its large bandgap of 3.27 eV and exciton binding energy of 60 meV at room temperature give it great importance in the field of optoelectronic devices and solar cell applications. Despite several approaches adopted for making ZnO thin films, various parameters affecting these materials still need to be investigated. Therefore, it is essential to evaluate optimum conditions for fabrication of highly oriented and transparent ZnO thin films. ZnO thin films were synthesized on ITO coated glass substrates by the sol-gel process using spin coating at 2500 rpm for 30 s. The precursor sol was prepared by mixing 2-methoxyethanol and zinc acetate dehydrate and using mono-ethanolamine as stabilizer. After annealing at temperatures of 350 deg;C, 450 deg;C and 550 deg;C, structural, optical and electrical studies were carried out. X-ray diffraction patterns show the crystalline nature of the ZnO thin films while the (002) peak reveals their hexagonal wurtzite structure. Scanning electron microscopy results revealed that the grain size decreases as the annealing temperature increases. Optical transmittance of the thin films was about 80% obtained in the range 400-800 nm using a UV-VIS spectrophotometer. The optical bandgap varies from 3.26 to 3.28 eV as calculated using Tauc's plot method. The band to band emission peak was observed at 384 nm and luminescence intensity increases with increasing annealing temperature. The current-voltage characteristics of ZnO films show ohmic behaviour and the resistivity decreases with increasing annealing temperature. These highly transparent and conducting ZnO thin films can be used in solar cells and optoelectronics devices.

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