PREPARATION OF NANOSTRUCTURED ZINC OXIDE THIN FILM BY ELECTROCHEMICAL DEPOSITION METHOD AT DIFFERENT VOLTAGE

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ABSTRACT

A study was conducted to prepare nanostructured zinc oxide thin film at different voltage by electrochemical deposition method. ZnO thin film was electrodeposited from an aqueous solution of $Zn(NO)_3$ on indium tin oxide (ITO)-covered glass substrates. The depositions were carried out at -1.2 V, -1.3 V and -1.4 V while the time is keep constant at 5 minutes. Field emission transmission, Uv-Vis and X-ray diffraction measurements were performed to characterize the ZnO films. X-ray diffraction studies indicated that the obtained ZnO film were polycrystalline. The results showed that the films were presented different morphologies, grain size ranging from 180 to 320 nm. ZnO obtained at -1.3V and -1.4 V were compact and homogeneous and the variations in the band gap of ZnO films deposited under different conditions are also discussed.

CHAPTER 1

INTRODUCTION

Nowadays, a low cost flat panel solar cells thin films devices have increasing rapidly. ZnO which is a low cost and wide bandgap semiconductor whose energy lies typically between 3.1 and 3.4 eV at room temperature are being widely investigate for their interesting optical properties and uses as solar cell window materials and mainly as a very good gas-sensing material. Scientists are interested in several nano-forms of ZnO like nanowires, nanorings, nanocombs, nanosprings, etc., because of their novel applications in dye-sensitized solar cells, optoelectronics, sensors, transducers and bio-medical science, since ZnO is considered to be bio-compatible. It is also promising for potential use as a UV light phosphor at room temperature due to free electron excitation, having sufficiently large binding energy to be stable even at room temperature. Electrochemical deposition (ECD) is a promising method for use in preparing large area electronic devices. In addition, ECD makes it possible to prepare thin films at a lower temperature with lower cost, lower energy consumption and higher raw material efficiency in comparison with the other conventional means. Thus, the ECD method is considerably less harmful to the environment than existing methods [5]. This research is to prepare and characterize nanostructure zinc oxide thin film by electrochemical deposition method and investigate the