NANOSTRUCTURED ZINC OXIDE THIN FILM PREPARED BY ELECTROCHEMICAL DEPOSITION TECHNIQUE AT DIFFERENT DEPOSITION TIME

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ABSTRACT

NANOSTRUCTURED ZINC OXIDE THIN FILM PREPARED BY ELECTROCHEMICAL DEPOSITION TECHNIQUE AT DIFFERENT DEPOSITION TIME

ZnO thin films were deposited on the ITO-coated glass substrate from aqueous electrolyte containing 0.01M zinc chloride ($ZnCl_2$) and 0.1M potassium chloride (KCl) with the initial pH value of 6.0. The temperature of the aqueous solution was regulated at room temperature (27°C). The experiments were performed in a conventional electrochemical cell with three electrodes. The working electrode was ITO substrate, a platinum wire was used as a counter electrode, and a silver chloride electrode (Ag/AgCl) as a reference electrode. One set of samples were successfully prepared to study the influences of the deposition time on the growth of zinc oxide (ZnO) films. The samples were deposited at -1.5 V for 5, 10 and 15 min, respectively. The sample was characterized using Field Emission Scanning Electron Microscopy (FESEM), X-Ray Diffraction (XRD), and Ultraviolet-Visible Spectroscopy (UV-Vis) respectively. ZnO films presented uniform distribution and grain size become bigger when depositions time were increased. The XRD analysis shows that the formation of ZnO is nanostructured. For their transmittance graph, it was found that the transmittance increased when the deposition time is decrease.

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Zinc oxide is often called an II-VI semiconductor because zinc and oxygen belong to the 2nd and 6th groups of the periodic table [7]. It usually appears as a white powder, nearly insoluble in water. Zinc oxide is an inorganic compound with the formula ZnO and stable structured and it also has unique properties and versatile application [1-9]. Good transparency, high electron mobility, wide band gap, etc are the properties of nanostructure ZnO. It crystallizes in three forms, hexagonal wurtzite, cubic zincblende, and cubic rocksalt. The wurtzite structure is most stable at ambient conditions, it present interesting electrical, optical, acoustic, and chemical properties [4]. ZnO is n-type semiconductor [8] with a relatively large direct band gap of 3.37 eV and high exciton binding energy about 60meV [1,3]. Therefore, pure ZnO is colorless and transparent. The several advantages of a large band gap are higher breakdown voltages, ability to sustain large electric fields, lower electronic noise, high temperature and high-power operation.