POST ANNEALING TEMPERATURE EFFECT ON PHOTOLUMINESCENCE SPECTROSCOPIC OF NANOSTRUCTURED ZnO THIN FILM BY TCVD METHOD

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ABSTRACT

This article summarizes briefly some important achievement from research on the effect of annealing temperature on the structural, electrical as well as photoluminescence (PL) properties of nanostructure ZnO thin film grown on ZnO template. The template were prepared by the spin-coating method. The ZnO thin films were deposited by thermal chemical vapor deposition (TCVD) technique using Zinc acetate dihydrate as a precursor. Deposited films are annealed at various temperatures from 650°C to 850°C. The optical properties are characterized using photoluminescence (PL) with 325nm UV light from a He-Cd laser at room temperature and the electrical properties are characterized using Solar simulator measurement unit. Field emission scanning electron microscopy (FESEM) used to determine the surface morphology of the samples.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

The applications of Zinc Oxide (ZnO) have attracted much attention in recent years. ZnO is an inorganic compound which is often called a II – VI semiconductor because zinc and oxygen belong to the 2nd and 6th groups of the periodic table, respectively. It has several unique properties such as non-toxicity, good electrical properties, high lumineous transmittance and low cost [1,3]. This metal oxide semiconductors has a wide direct bandgap energy of 3.37eV and a larger free-exciton binding energy of 60meV at room temperature [2]. The property of ZnO is dependent partly on the crystallinity, crystallographic orientation, crystallite size and morphology. Interest in the research effort on ZnO is driven by various applications in blue and ultraviolet (UV) light emitters [4,5], solar cell windows [6,7], photovoltaic device, gas sensor and surface acoustic wave device [8].

Recently, ZnO thin films have been prepared by various techniques, such as R.F. magnetron sputtering [9,10], reactive magnetron sputtering, chemical vapor deposition [11,12], ion-beam evaporation, electron-beam evaporation, spray pyrolysis [13,14], laser ablation and sol-gel process [15, 16]. Among them, the chemical vapor deposition technique has advantages in growth on large area substrates and mass production with a continuos system. However, the deposition of zinc oxide by chemical vapor deposition has seen increased research activity over the past several years as the need for high quality zinc oxide thin films has increased [19,20]. Post annealing treatment is a conventional and effective technique to reduce intrinsic defects and to improve the crystallinity in thin films [17].

In this work, thermal CVD has been used because of its relatively low cost and simple method [18]. The ZnO templates were prepared using sol-gel spin-coating method. The ZnO thin films were deposited by thermal chemical vapor deposition (TCVD) technique used Zinc acetate dihydrate as a precursor. Properties of films