UNIVERSITI TEKNOLOGI MARA

INVESTIGATION ON SPIN SPEED OF TIN OXIDE (SnO_2) THIN FILM VIA SPIN COATING TECHNIQUE FOR SOLAR CELL APPLICATION

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ABSTRACT

This thesis investigates the relationship between thickness, resistivity, conductivity and the surface roughness of Tin Oxide (SnO_2) by using sol-gel spin coating technique. SnO_2 thin film were deposited onto glass substrates via sol-gel spin coating technique with different spin speed. The thin films were annealed at 450°C for 2 hours and the effects of the different spin speed on physical, optical, and electrical properties were investigated by using X-Ray Diffraction (XRD), Atomic Force Microscopy (AFM), Field Emission Scanning Electron Microscope (FESEM), Surface Profiler (SP) and I-V measurement. The XRD has investigated on the crystallinity of the thin film and the AFM and FESEM shows the variations in the grain size and the roughness of the films as the spin speed was increased. Also, the Surface Profiler (SP) characterization showed the different thickness of the thin films for every different spin speed and the readings for current and voltage of the thin films obtained through I-V measurement. The findings showed that the faster spin speed lead to higher resistivity and lower the conductivity. The different grain size and surface morphologies of the thin films obtained with the different spin speed. This thesis has concluded that, SnO_2 thin films has a smoother surface, increased value of thickness, and also led to a higher value of resistivity and lower the conductivity as the value of the spin speed increased.

Keywords: tin oxide; spin coating; sol-gel method; spin speed; conductivity;

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.0 CHAPTER OVERVIEW

Introduction related to this project was covered in this chapter. Problem statement, objectives, scopes of project and thesis organization was stated.

1.1 BACKGROUND OF STUDY

Transparent conducting oxide (TCO) thin films was used in many devices such as solar cells and light emitting diode [1]. The rare combination of electrical conductivity and optical transparency of TCOs materials are well-known. Tin Oxide (SnO_2) is one of the metal oxides that most popular transparent coatings were fabricated from [1]. Owing to their potential applications, SnO_2 thin films have attracted many attention recently. Tin oxide were exists in two different forms which are stannous oxide and stannic oxide. SnO_2 is usually known as the oxygen-deficient n-type semiconductor with wide energy band gap which is 3.7eV [7-8]. It is a well-known fact that the surface properties of the TCOs thin films can influence the films' optical and electrical properties, which are the two most important elements in any applications of optoelectronics devices [2-3, 5-6].

SnO_2 thin films can be prepared using various methods, such as ultrasound-assisted and microwave-assisted methods, pulsed laser deposition, thermal, electron beam evaporation, sputtering, vapor-liquid-solid synthesis, hydrothermal deposition, spray pyrolysis and sol-gel methods [2, 7]. From the various techniques available to produce tin