UNIVERSITI TEKNOLOGI MARA

EFFECT OF DIFFERENT DISTANCE ON SNO_2 THIN FILMS USING ELECTROSPRAYING METHOD

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Final year project report submitted in fulfillment of the requirements for the degree of

Bachelor of Engineering (Hons) Electronics Engineering

Faculty of Electrical Engineering

JANUARY 2019

ABSTRACT

This work investigated the effect of different distance between needle tip and collector by electrospraying method of SnO_2 thin film on electrical, physical and optical properties. SnO_2 solution was prepared by dissolved $SnCl_2 \cdot 2H_2O$ (Tin (II) Chloride dihydrate) in absolute ethyl alcohol. It were annealed at 500°C for 1 hour in a furnace. Distance is one of the parameter that will affect properties of SnO_2. The distance between needle tip and collector will affect the structure for surface morphology on thin films. The closer distance will affect the increasing grain size of the nanoparticles. The surphace morphology of deposited layer were observed using Field Emission Scanning Electron Microscope (FESEM). Meanwhile, UV-Vis was to observe its optical properties. The optical transmittance showed that the further distances will resulted high transmittance in the visible light region (300nm- 800nm). The deposited sample was then tested using an IV equipments to see its response on the voltage and current and analyse its electrical property. It was recorded that the decreasing of distance can increase the I-V for the electrical properties.

Keywords: SnO_2; thin films; electrospraying; distance;

ACKNOWLEDGEMENT

Praise goes to Allah S.W.T, who created the whole universe for giving me his blessing and granted me the capabilities in order to complete my Final Year Project Report, which is "Effect of Different Distance On SnO_2 Thin Films Using Electrospraying Method". By completing the course of this Degree final year project report, I got support from my supervisor, teammate, parents and all friends. I am very grateful for the kindness and gratitude for all of them.

Firstly, I would like to acknowledge Dr Puteri Sarah Mohamad Saad as my supervisor for helping and guiding me throughout completing this final year project. Futhermore, I would like to thank technician laboratory, Encik Suhaimi, Encik Asrul and Encik Azwan, for monitoring and helping me while using the equipment in the laboratory.

I would also like to thank UiTM for providing lab and equipment to use during completing my experiment. Finally, I want to thank my friends for supporting me and my parents who always believed and encouraging me during completing my research.

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CHAPTER 1

INTRODUCTION

1.0 BACKGROUND STUDY

Tin (IV) oxide (SnO_2) is an intrinsic n-type wide-band gap (3.6 eV) semiconductor with applications including solar cells, gas sensors, transistors, electrodes, liquid crystal displays, and catalysts [1]. The properties of SnO_2 that influence its potential applications depend on the different phases of its fabrication history, synthesis routes and methods [2]. The SnO_2 coating is formed by deposition from a liquid coating composition including an organotin compound [3]. SnO_2 was used in many fields such as transparent conducting films, catalytic materials, environmental monitoring, biochemical sensor, lithium rechargeable batteries, dye-sensitized solar cells and ultrasensitive gas sensors [4]. According to [5], there are several factors that are quantified such as the effects of distance between the needle tip and collector, and syringe feed rate on the size of sprayed area [6].

The efforts have been contributed to the application of electrospraying technique as well the physical understanding of the droplet evolution in the electrospraying process [7]. The trajectories of droplets are affected by many controllable parameters, i.e. syringe feed rate, concentration of solution, applied voltage and needle gauge [8]. The size of the electrosprayed droplets was able to be tuned by adjusting controlled parameters. The thin film of SnO_2 can be prepared by different deposition techniques such as spray pyrolisis, electrospraying, sol gel dip coating, chemical vapour deposition, electron beam evaporation and sputtering [5].