SURFACE MORPHOLOGY STUDIES OF TITANIUM DIOXIDE THIN FILM FOR SOLAR CELL APPLICATION

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UNIVERSITI TEKNOLOGI MARA

NURSUHAILA BINTI AHMAD MURID

FACULTY OF ELECTRICAL ENGINEERING

UNIVERSITI TEKNOLOGI MARA

40450 SHAH ALAM SELANGOR,

MALAYSIA

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ABSTRACT

This paper presents the research on surface morphology studies of titanium dioxide (TiO_2) for solar cell application by using sol-gel method prepared by spin coating technique. The TiO_2 solutions have been prepared by sol-gel method. TiO_2 thin films have been deposited on silicon and glass substrates by spin coating technique. The surface morphology and electrical properties were characterized by Scanning Electron Microscopy (SEM) and current-voltage (I-V) measurement, respectively. It was found that concentration of glacial acetic acid and various annealing temperature will affects on the surface morphology and resistivity of the films.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Titanium dioxide (TiO_2) has many interesting physical properties, which make it suitable for thin film applications. Because of their good transmittance in the visible region, high refractive index and chemical stability, TiO_2 films have found wide application for various optical coatings [1, 2].

TiO_2 thin films have successfully been used in photodecomposition of water, purification of environmental pollutants, and preparation of solar energy cells. TiO_2 thin films have been made by a variety of techniques such as an electron - beam evaporation, magnetron sputtering technique, anodization, chemical vapour deposition (CVD) and sol gel techniques. Among the different methods for the preparation of TiO_2 thin electrochromic layer, sol gel method has many advantages, particularly the possibility of producing large surfaces [3-6].

Sol gel method is very suitable for the production of oxides layers of many compositions on various substrates such as silicon or glass. Spin coating is used for many applications where relatively flat substrates or objects are coated with thin layers of material. The Scanning Electron Microscope (SEM) is a type of electron microscope capable of producing high resolution images of a sample surface. The current-voltage (I-V) measurement can measure directly the current-voltage of thin films.

A solar cell is a semiconductor device that converts photons from the sun (solar light) into electricity. The various thin-film technologies currently being developed reduce the amount of light absorbing material required in creating a solar cell. This can lead to reduced processing costs from that of bulk materials