

**Effect of Aging Time During Preparation of Titanium Dioxide Thin  
Films Prepared By Sol Gel Spin Coating Method**

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**MD BAHARIN SABRI BIN NASIR  
FACULTY OF ELECTRICAL ENGINEERING  
UNIVERSITI TEKNOLOGI MARA (UiTM)  
40450 SHAH ALAM  
MALAYSIA**

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Md Baharin Sabri Bin Nasir  
Faculty of Electrical Engineering  
Universiti Teknologi MARA (UiTM)  
Shah Alam  
Selangor

## ABSTRACT

The effect Of Aging Time on the Physical, optical and electrical properties of Titanium Dioxide( $\text{TiO}_2$ )thin films prepared by Sol-gel method were investigated.  $\text{TiO}_2$  Solution were aging for 20minutes, 60 minutes and 100 minutes.  $\text{TiO}_2$  thin film were deposited on glass substrate using spin coating technique. For the physical properties, the surface roughness is characterized using Atomic Force Microscopy(AFM). UV-Vis will analyze the optical transmittance and absorbance. For electrical properties, I-V characteristic was measured using solar simulator by two probe method. The result indicated as we increased the aging time, the surface roughness of  $\text{TiO}_2$  thin film is increased. The resistivity of  $\text{TiO}_2$  thin film was lowered when the aging time is increased. Since the resistivity become lowered, the conductivity will be increased. Optical properties shown that transmittance will be decreased and absorbance will be increased as the aging time and surface roughness increases.

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# CHAPTER 1

## INTRODUCTION

### 1.1 INTRODUCTION

In the recent years, metal oxide nanoparticles are widely investigated due to their special chemical and electronic properties. Among the metal oxide semiconductors, Titanium Dioxide ( $\text{TiO}_2$ ) has been widely studied for its interesting electronic properties, optical properties and good stability in adverse environments. Because of its wide band gap, high refractive index and chemical stability, polycrystalline  $\text{TiO}_2$  thin films are used for variety of application such as dye sensitized solar cell [1], optics industry [2], self cleaning purposes [3], dielectric applications [4], and photocatalytic layers [5]. A very thin highly transparent  $\text{TiO}_2$  thin films was used as an anti reflection coating to increase the transmittance in heat mirror [6]. Heat mirror is a device that can show high transmittance at a short wavelength and high reflectance at long wavelength. Its function is to prevent indoor heating from escape in cold climate and reflecting the solar heat in warm climate. Usually, heat mirror is constructed from multilayer of dielectric materials/metal/dielectric materials. Ag, Au, Al, Cu or metal such as ZrN or TiN is used as a metal layer.  $\text{TiO}_2$ , as a dielectric materials, is widely used as antireflection coatings [7-10].

$\text{TiO}_2$  is an oxide of titanium that occurs naturally. It is harmless, cheap, white and non-biodegradable material.  $\text{TiO}_2$  can exist as amorphous layer and also in three structure which is anatase (tetragonal), rutile (tetragonal) and brookite (orthorhombic).