

INVESTIGATION ON DIFFERENT NUMBER OF DIPPING CYCLES OF  
TiO<sub>2</sub> THIN FILMS BY DIP COATING TECHNIQUE

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## ABSTRACT

This research study the properties of Titanium dioxide ( $\text{TiO}_2$ ) thin films deposited on glass substrate by sol-gel dip coating technique. The objective of the research is to get uniform thickness of  $\text{TiO}_2$  thin film with different number of dipping cycles. The  $\text{TiO}_2$  sol-gel thin films will be characterized by UV-Vis spectrophotometer, Atomic Force Microscopy (AFM) and Surface Profiler. The  $\text{TiO}_2$  sol-gel thin films will be deposited by using dip coating technique as this technique can give uniform thickness of  $\text{TiO}_2$ . The results are expected to give uniform thickness as the in number of dipping cycles increases. Characterized the  $\text{TiO}_2$  thin film results on optical and physical characteristics. These results suggest that thickness influences the properties of  $\text{TiO}_2$  thin films. Finally, to emphasize that uniform thickness of  $\text{TiO}_2$  sol-gel thin films is achievable by using dip coating technique.

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# CHAPTER 1

## INTRODUCTION

### 1.1 BACKGROUND OF STUDY

Titanium dioxide ( $\text{TiO}_2$ ) thin films are special materials with wide spectrum of applications in the field such as photocatalytic system, optoelectronic devices and protection anti-reflection coatings.  $\text{TiO}_2$  have three different crystalline forms which are rutile (tetragonal), anatase (tetragonal) and brookite (orthorhombic).  $\text{TiO}_2$  is an important inorganic functional material with good optical and physical properties which make it suitable for thin films application.  $\text{TiO}_2$  thin films can be prepared by various techniques such as sol-gel, chemical vapour deposition, pulsed laser deposition or sputtering[1].

Dip coating based on sol-gel process is one of the most useful method to obtain uniform thickness of  $\text{TiO}_2$  sol-gel thin films[2]. The sol-gel dip coating technique are particularly efficient in producing thin, transparent, multi-component oxide layers of many composition on various substrate including glass and can also cover large surface area[3]. Sol-gel dip coating is very successful and attractive method to the production of thin glass films at low cost. There are a lot of advantages of sol-gel dip coating method such as low process cost, uniform thickness, can cover large surface area and can vary the film properties by changing the composition solution and dipping parameters[4].

From the previous work, the thickness uniformity varies either on the temperature, withdrawal speed and chemical composition of solution of  $\text{TiO}_2$  by sol-gel dip coating technique[2][5]. The thickness varies from 80 to 200 nm depending on the number of coatings[6]. The thickness of the  $\text{TiO}_2$  layers measured is not smooth, rough and wrinkled. Moreover, the optical absorbance in UV region is increases as the number of