



**UNIVERSITI TEKNOLOGI MARA**

**INFLUENCE OF ANNEALING TEMPERATURE ON  
STRUCTURAL, ELECTRICAL AND OPTICAL  
PROPERTIES OF TUNGSTEN DOPED VANADIUM  
DIOXIDE THIN FILMS BY SOL-GEL SPIN  
COATING METHOD.**

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## ABSTRACT

In this project, Tungsten doped with Vanadium oxide thin films was deposited by using sol-gel method, spin coating technique. Vanadium dioxide was selected because of their thermochromic properties that can change optical and electrical properties due to variation of temperature [1]. This ability made it a good material for the smart window application. From previous researcher the doped transition temperature of vanadium dioxide can be improved by added tungsten [2],[1].

Sol-gel is a method to producing solid material from a chemical. It is the most trustfully liquid phase deposition process for obtain successful result for thin film [3]. Sol-gel is the simplest, cheaper and no complicated process equipment needed to be done. These methods can be used to obtained little tiny result from transparent, nanometer scale. One of the main advantages of sol-gel method was very high accurate in diameter, cross-sectional area and the thickness of layer wall [4]. The precursor was formed by mixing the Vanadium oxide, Tungsten and the isopropanol solution. Quartz substrate was doped with precursor prepared for annealing process. Quartz substrate was selected due to suitable in handling all value including high annealing temperature [5], [6], [7]. 5 sample of quartz substrates needed with size 2cm x 2cm.

The deposition of tungsten with vanadium dioxide thin films was prepared using spin coating method. All the sample have been studied in various temperature in annealing process [8], [9]. Five different temperature 450°C, 500°C, 550°C, 600°C, 650°C was selected in annealing temperature for 5 hours and 30 minutes. The characterization of surface topology and the thickness of the samples were performed using field emission scanning electron microscopy (FESEM). While the electrical properties were measured using IV-measurement system. The optical properties were measured using ultraviolet-visible (UV-Vis).

As conclusion, all the samples shown different characteristic based on different annealing temperature been used.

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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 BACKGROUND STUDY**

In recent year our contrary was affected by worldwide global warming. In order to overcome this destruction, nanotechnologies “Green” need to be addressed urgently [1]. Nanotechnology is a process of manipulating atomic or molecular in the fabrication process. It can help to reduce the energy consumption in building [2] which will increase from 50% to 48% by year 2030 [3]. As the population increase, every country were demanding to increase the housing development to cover up the population growth. The increasing of housing is the major problem of increasing energy consumption it may be the major cause of excesses of carbon dioxide and greenhouse gas emission [3]. The International Energy Outlook said that the total global energy will continue to grow to 56% by year 2040. It shown the total global warming will always increasing year by years. Previous researcher stated that the greenhouse gas emission in Malaysia contribute 40% carbon gases to the environment [3].