EFFECT OF ANNEALING TEMPERATURE ON THE SURFACE MORPHOLOGY OF TITANIUM DIOXIDE THIN FILMS PREPARED BY SOL-GEL METHOD

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ABSTRACT

EFFECT OF ANNEALING TEMPERATURE ON THE SURFACE MORPHOLOGY OF TITANIUM DIOXIDE THIN FILMS PREPARED BY SOL-GEL METHOD

Titanium dioxide (TiO_2) thin films have been prepared using sol gel method and deposited by spin coating technique. TiO_2 thin films were deposited on silicon and glass substrates. The influence of annealing temperature from 300°C to 500°C on the surface morphology, structural and optical properties were characterized by Scanning Electron Microscopy (SEM), X-Ray Diffraction (XRD) and Ultraviolet visible spectroscopy (UV-Vis). The SEM image of thin film deposited on silicon substrate shows the grain boundary of TiO_2 is large and decrease with higher annealing temperature. While for thin films deposited on glass substrate do not shows any significant difference as the annealing temperature increased. This might happen due to lattice mismatching. Structural properties from the XRD analysis show that the TiO_2 thin film is nanocrystalline anatase phase. While UV-Vis shows the thin films has high transmittance percentage of visible light and fully absorb the UV light at wavelength of 300 nm.

CHAPTER 1

INTRODUCTION

1.1 Background

Titanium dioxide (TiO_2) has getting some attention from the science and technology field because of its beneficial that can be obtained from it. TiO_2 has the amazing chemical, electrical and optical properties such as high refractive index, high dielectric constant and transparent to visible light (Deshmukh et. al, 2006).

TiO_2 thin films is widely used in many applications such as gas sensor (Skubal et. al, 2002), photocatalysis (Ao et. al, 2007) and corrosion protection (Mateus et. al, 2006). It also has been used for electronic device applications such as dye-sentisized solar cells (DSSCs) (Bernard et. al, 2007) as well as antireflective (AR) coating and electrochromic device (Donald et. al, 1999). TiO_2 thin film in anatase phase could accomplish the photocatalytic degradation of organic compounds under the radiation of Ultraviolet (UV). So, it has variety of application prospects in the field of environmental protection (Dumitriu et. al, 2000 and Takeda et. al, 2001).

There are many techniques to prepare thin films such as DC magnetron sputtering (Takeda et. al, 2001), viz. electron beam evaporation (Zhang and