UNIVERSITI TEKNOLOGI MARA

INVESTIGATION ON BREAKDOWN VOLTAGE OF TIO_2 DOPED AL_2O_3 VIA SPIN COATING METHOD

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ABSTRACT

Thin films of TiO_2 doped Al_2O_3 were prepared by spin coating method on glass substrate. The main objectives of this project are to prepare the TiO_2 doped Al_2O_3 thin films for measuring the breakdown voltage and to characterize the electrical, physical and optical properties TiO_2 doped Al_2O_3 of thin films. Characterization of the thin films were carried out using different characterization techniques such as X-Ray diffraction (XRD), breakdown voltage and UV-Vis. Different percentages of Aluminum Oxide (Al_2O_3) in TiO_2 were 0at%, 2at%, 4at%, 6at%, 8at% and 10at%. The thin films were annealed at 450°. The results show the breakdown voltage increased as the percentage of the atomic of Al_2O_3 increased. The XRD analysis of the thin films showed amorphous behaviors. The anatase phase transformation of TiO_2 was formed as the thin films annealed at 450°. Further analysis on UV-Vis also has found that the percentage of transmittance of TiO_2 doped Al_2O_3 increased as the percentage of atomic of Al_2O_3 increased. In contrast to the transmittance spectrum, the percentage of absorbance of TiO_2 doped Al_2O_3 was found to be decreasing with increasing of the percentage of atomic of Al_2O_3.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Titanium dioxide (TiO_2) thin films have received a great deal of interest due to an important number of applications such as electrochromic, photovoltaic and microelectronic devices. Its electron transport properties remain back due to its high resistivity. Although many structural and optical studies were carried out for TiO_2, the impurity band conduction may become significant even above room temperature due to TiO_2 semiconductor thin films having a high energy gap. Electrical conductivity processes are mainly due hopping via impurity centers, while the contribution of intrinsic free carriers is negligible even at high temperatures. The measured conductivity of TiO_2 thin films is generally explained in terms of the simple thermally activated conduction at high temperatures ($T > 300$ K).

Doping is a reversible produce which could be carried out chemically or electrochemically with oxidation or reduction by accepting or donating the electrons respectively and thus results to the positive or negative charges. By adding the dopants such as Nb, Cr, Sn, Pt, Zn, Al, La and Y, it has been showed that the sensitivity of TiO_2 can be improved. TiO_2 is well known that the impurity doping induces substantial modifications in electrical and optical properties of semiconductor materials. Increased in conductivity, slowing down anatase to rutile transformation and reducing grain growth are the most important effects of dopants addition in TiO_2 Recent studies has reported that the N-doping shift that absorption band associated with the band gap narrowing. The process