SYNTHESIS AND THERMAL STUDIES OF TITANIUM DIOXIDE PREPARED BY SOL-GEL METHOD

SITI MAISARAH BINTI ZAID

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ABSTRACT

SYNTHESIS AND THERMAL STUDIES OF TITANIUM DIOXIDE (TiO_2) PREPARED BY SOL GEL METHOD

A titanium dioxide (TiO_2) powders was synthesized by the sol-gel method under room temperature using titanium nitride (TiN) as the precursor. The titanium dioxide powder then was characterize using simultaneous thermal gravimetric analyzer (TGA) to measure the weight loss of a material as a function of temperature. From TGA results, the stable weight loss of titanium dioxide powders was observed in the temperature range of 750°C. Then, 3 samples were prepared which annealed at temperature 800°C for 5 hour, 800°C for 10 hour, and 800°C for 24 hour. The titanium dioxide synthesized powders was characterized by X-ray diffraction (XRD). XRD patterns revealed that, the samples comprise a single phase rutile structure of titanium dioxide. The crystal structure of titanium dioxide is tetragonal where it space group is s P42/mnm. No anatase peak can be observed after sintering at 800°C. So, only rutile peak are dominate. From the result of the phase and structure of titanium dioxide, a single phase rutile can be synthesized by sintering at a temperature of 800°C for only 5 hour.

CHAPTER 1

INTRODUCTION

1.1 Background of Study

According to the Shipeng Qiu and Samar J.Kalita (2006), titanium dioxide (TiO_2) ceramic is used in a variety of applications in industry and in our daily life. Titanium dioxide has long been known to exist in three polymorphs in nature which are rutile, anatase and brookite. Amongst these, anatase and rutile are of engineering importance because of their unique properties. In all applications, the particle-size of the titanium dioxide powder used in the fabrication of a device or its components plays a vital role in performance. For catalytic applications, the total surface area is of very high importance, which can be significantly increased by reducing particle size, examples using nanocrystalline ceramics. Because of their high surface area to volume ratio, nanocrystalline ceramics also shows potentiality to offer remarkable improvement in mechanical, optical, chemical, as well as electrical properties (O.K. Tan *et al.,* 2004). There is a need to develop simple processes to synthesize titanium dioxide powder and to study the importance and influence of powder on the properties of sintered structures. A number of methods have been used to prepare titanium dioxide powder, such as