CHAPTER I

INTRODUCTION

Titania (TiO_2) is an important semiconductor and has many important applications in pigment, photocatalysts, solar cell, ceramics, inorganic membranes, sensors, environmental purification, and so on.

The sol gel method is popular method for synthesis titanium dioxide. This method involved the transition of a system from liquid phase to (the colloidal "sol") into a solid phase (the "gel"). The main process of sol-gel consists of gelation aging drying and heat treatment. In a general drying process, gel is dried under air to form "xerogel", which possesses low porosity and surface areas due to pore collapse. In order to avoid the collapse, gel can be dried under supercritical condition to form "aerogel".

In photocatalytic application, irradiation on the surface of titanium dioxide with energy higher than bandgap excites electron from valance band to conduction band. The electron trapped by titanium dioxide, reacts with O_2 and H_2O to form hydroxyl radical. Whereas, the hole is trapped by the surface hydroxyl groups. Then the trapped hole forms hydroxyl radical. The hole and free radical are capable of oxidizing organic molecule.

Owing to the unique morphology and chemical properties such as mesoscopic pore size, high surface area, large pore volume, and ultra low density, aerogel potential enhance activity of photocatalytic reaction.

For this work, we prepared titanium dioxide from controlled hydrolysis of titanium isopropoxide with different solvent and studied the influence of heat treatment condition on properties of resulting aerogels and xerogels. Then titania samples were tested in photocatalytic degradation of ethylene in gas phase.

Objectives of the research:

1. To study preparation technique for titanium dioxide aerogel.
2. To invetsigate effect of preparation parameters on properties of titania aerogels and powder
3. To compare photocatalytic activities of titania aerogels to xerogels.

The thesis is arranged as follows:

Chapter I is the introduction of this work.

Chapter II presents literature reviews for titanium dioxide aerogel and photocatalytics reaction.

Chapter III presents theory of aerogel and photocatalytic reaction.

Chapter IV describes various preparation methods for TiO_2 aerogel and xerogel and characterization techniques for the catalyst.

Chapter V presents the experimental results and discussion of the research.

In the last chapter, Chapter VI, the overall conclusions and recommendations for the future studies are given.