CHAPTER I

INTRODUCTION

Large amounts of fossil fuel, oil, gas or coal are burnt to fill the urgent need for energy conversion process : industrial processes, stationary sources, and non-stationary sources. Huge amounts of pollution are emitted daily with the effluents evolving from these processes producing solid, liquid, and gaseous wastes. As well as fly-ash and dust, the emission of sulphur and nitrogen oxides overloads the environment. These oxides are formed by the burning of fossil fuels. Such emissions are blamed for the formation of acid rain and other environmental problems.

The selective catalytic reduction (SCR) are a number of commercial approaches to NO_x removal which include adsorptive, thermal, and catalytic. The SCR process uses a catalyst to facilitate reactions between NO_x and ammonia in the presence of oxygen :

$$4\,NO + 4\,NH_3 + O_2 \rightleftharpoons 4\,N_2 + 6\,H_2O$$

With the emergence of improved catalysts. The SCR process is seeing increased application in the coal and methane fired power plant, especially with regard to its long life in wet, high oxygen, sulphur containing environments.

Vanadia-titania catalysts are the most widely used and studied catalysts for the selective catalytic reduction (SCR) of NO_x by ammonia [1-6]. Although there are other catalysts investigated for the selective catalytic reduction (SCR) of NO_x , such as tungsten oxide, molybdenum oxide, copper oxide, chromium oxide, and zeolites [7-11], the vanadium oxide supported titanium oxide catalysts seem to quite superior to other alternatives due to their high activity, thermal stability, and high resistance to poisoning by sulphur dioxide.

In this work, we investigated the catalytic behavior of V_2O_5/TiO_2 catalysts of variable vanadium oxide loading for the selective catalytic reduction (SCR) of NO_x with ammonia reaction. The main objective of this research is to find a suitable catalyst for this reaction. To achieve this aim, the following topics were investigated

1. Preparation technique.
2. Effect of vanadium oxide loading.

This thesis is divided into the following chapter :

Chapter II presented a literature reviews of investigation over V_2O_5/TiO_2 catalysts for selective catalytic reduction (SCR) of NO with ammonia and some comment on the previous paper .

The theory of this work, studies overview of principle of catalytic combustion, formation of NO_x , reduction of NO_x by catalyst technology, and titanium oxide supported vanadium oxide are presented in chapter III.

In chapter IV, the experimental systems and the operational procedure are described.

The experimental results obtained from a laboratory scale reactor is reported and discussed in chapter V.

Chapter VI gives overall conclusion emerged from this work and presents some recommendations for any future works.

Finally, sample of calculation, chemical component of TiO_2 support, and operating condition and samples of NO_x analyzer are included in appendix at the end of this thesis.