CHAPTER I
INTRODUCTION

Nowadays, air pollution is the critical environmental pollution that has been widely concerned because it affects in many big cities. Air pollutants are emitted daily by stationary and nonstationary sources. The first type includes industrial processes, energy production, waste incineration and domestic burning, whereas the second type includes automotive and airplane emission.

Air pollutants consist of carbon monoxide (CO), oxides of nitrogen (NO_x), unburned hydrocarbon (HC), oxides of sulfur, heavy metal, etc. However, the first four pollutants are considerable in air pollution problem. Minimization of NO_x, SO_2 and CO_2 emissions is main in the effort to protect environments.

NO_x refer to oxides of nitrogen, NO and NO_2. They are still major components in air pollution and are a regulated emission. They are formed in all combustion processes of fossil fuels and power plants when the oxygen source is air by combining nitrogen and oxygen present at the temperature of more than 1500 ^{o}C. NO is released around 96% of all NO_x emission (Botsford, 2001). NO is the key starting component for the production of other nitrogen oxides which contribute to many environmental problems such as acid rain formation, destruction the ozone layer, production of photochemical smog, lung infection and respiratory system allergy in human beings.

There are several technologies for NO_x controlling. Selective catalytic reduction (SCR) is the most efficient post-combustion process reducing NO_x emissions to harmless substances normally found in the air that we are breath. SCR by ammonia has shown to be effective for controlling NO_x to levels as low as 2 ppm (Botsford, 2001). Therefore, ammonia is appropriate to be used as a reducing agent which is then put through a catalysing process that the NO_x change to harmless nitrogen gas and water, ammonia provides nitrogen atom to form nitrogen gas easily.

According to the thermodynamics, NO is an unstable compound especially at very high temperatures. However, the decomposition rate is very low, and hence, it is adventageous to apply a catalyst. A large number of experimental studies over a

variety of catalysts have been carried out on suitable catalysts for the decomposition. The study of new catalysts for selective catalytic reduction using pillared clay and ion-exchanged pillared clay is promising. Pillared clays are an alternative support for the catalysts. Catalysts can be prepared by using inorganic materials such as polyoxoanions as a pillaring agent intercalated between clay layers. Types of polyoxoanions can be controlled by temperature, pH, and time in preparation. Pillared clays provide high thermal stability and surface acidity, which is very important for SCR of NO_x by ammonia. Therefore, the pillared clays have interesting properties, and their chemical functions can be modified by various techniques to accomplish the most efficient catalyst.