CHAPTER I
INTRODUCTION

Nitrogen oxides (NO_x, x=1, 2) resulting from high temperature combustion of fossil fuels in internal combustion engines, power plants, and also produced from the catalytic oxidation of ammonia in the preparation of nitric acid in nitric acid plant are still a major source for air pollution. They contribute to photochemical smog, acid rain, and depletion of ozone layer.

Selective catalytic reduction (SCR) of NO_x by ammonia (NH_3) in the presence of oxygen forming nitrogen and water is the most efficient technology for removing NO_x emission from power plant and other stationary sources. Many catalysts have been reported to be active for this reaction. Vanadia-based catalysts (V_2O_5/TiO_2 catalyst) mixed with WO_3 and/or MoO_3 as promoters are the commercial catalysts that have been used. However, major disadvantages of these catalysts remains, such as their toxicity, high activity for the oxidation of SO_2 to SO_3 and selectively for forming N_2O. Hence, there are continuing efforts for developing new catalysts.

Pillared clays or pillared interlayer clays (PILCs) are the two-dimensional zeolite-like materials prepared by exchanging the charge-compensating cations or anions between the clay layers with larger inorganic cations or anions. PILCs have been studied as catalysts in some catalyzed reactions, e.g., fluid catalytic cracking, alcohol dehydration, and alkylation. PILCs have been found to be H_2O/SO_2 resistant catalysts and high activities for SCR of NO by NH_3 providing desirable characteristics such as high thermal stability and surface acidity, which are very important for SCR of NO_x by NH_3. Moreover, the PILC catalysts are inexpensive catalysts as compared with the commercial-type catalysts.

The aim of this study is to develop the new catalysts for SCR of NO_x with NH_3. In this study, pillared clay catalysts were derived from a hydrotalcite-type clay. Hydrotalcite-type clay is an interesting material because it is a class of anionic clays suitable for the negatively charged polyoxometalate pillars which present a wider range of thermal stability than polynuclear transition metal halides, and hydroxyl metal cations. In addition, previous studies showed pillared clay catalysts derived

from a hydrotalcite-type clay had higher N_2/N_2O selectivity over the commercial-type catalysts (Rochautama, 2003). Therefore, the hydrotalcite-type PILCs have interesting properties, and the chemical functions can be modified by various techniques to accomplish the best efficiency.