CHAPTER I

INTRODUCTION

Formation of nitrogen oxide, NO_x, is a serious problem to the world today. The Third Annual Report of the Council on the Environmental Quality (August ,1972) estimates the annual total emission of nitrogen oxide at 22.7 million tons (1979 estimate). Nitrogen oxide is formed mainly by high temperature combustion of fossil fuel in automobiles and in the electrical power industry. Other sources, which can be of geographically localized importance, include stationary internal combustion engines , gas turbines , diesel engines and industrial processes.

Nitrogen oxide can have many undesirable effects on materials and plants, and an adverse effect on human health. Nitrogen dioxide, NO_2, and nitric oxide, NO are known to cause fading of acetate, cotton, and rayon fibers (under condition of high humidity). Wet gases containing NO_x contribute to stress corrosion failures of metal. Long term exposure to small amount of NO_x can cause spotting on plant leaves. Nitric oxide will attach to hemoglobin in a manner very similar to that of carbon monoxide and is a well known irritant to respiratory tract and eyes. Effects of different doses of NO_2 range from emphysema to death within 48 hours

(Eckman, 1979). Finally, it is estimated that 30 to 40 % of acidity in the Northeastern United State is due to NO_x (Zajicek, 1983).

Nitric oxide is the main product from the combustion of the nitrogen in the nitrogen bearing fuel and is also formed by oxidation of the N_2 in the combustion air. Nitric oxide can then be oxidized to nitrogendioxide in the air by molecular oxygen or, more quickly, by ozone. This nitrogen oxide is a principal cause of air pollution,since it absorbs the radiation from sunlight, causing smog forming reaction. In 1982, J. F. Maxwell reported the sources and the amount of air pollutants in Bangkok, as shown in Table 1.1.

Table 1.1 Source of air pollutants in Bangkok,1982

Source	Unit,%				
	carbon monoxide	sulfur containing compound	hydro carbon	nitrogen containing compound	Total
internal combustion	90-95	50	80	80	85-90
industrial plants	1	50	10	20	5-10
refuse combustion	5-10	very small	10	very small	10-15

From : Business in Thailand " Air Pollution I, Bangkok Toxic", April 1982, PP. 34-38.

From Table 1.1, it indicates that internal combustion such as the combustion of automobiles, diesel engine, and stationary internal combustion engines of power plant is the main source of nitrogen compound emission. Nittaya Mahapol and Wongsapan Limpasenee reported in 1988 the percentage of pollutants caused by Bangkokians' activities and the source of each type of pollutants, shown in Table 1.2.

Table 1.2 Percentage of pollutants emitted in Bangkok,1988

source	dust	sulfur dioxide	nitrogen oxide	hydro carbon	carbon monoxide
1. fuel combustion	70	84	94	41	16
2. industrial processes	23	5	1	15	28
3. traffic	7	11	5	44	56
Total	100	100	100	100	100

From : W. Martin and A. Economopoulos "Rapid Assessment of water and Air pollution Source in Bangkok", W.H.O. Regional office for South East Asia,Bangkok, Thailand, January, 1988, pp. 27

Table 1.2 shows that a large amount of pollutants are emitted into the air in Bangkok leading to serious air pollution problems in the near future. Therefore, it is necessary to search for the suitable method in order to protect the environment from industrial

pollutions since the quality of life should be considered in consistent with development of the country.

1.1 Objectives of the work

The objectives of this project were as follows:

1.1.1 Study the reduction of nitric oxide by catalytic reaction with ammonia

1.1.2 Find out the optimal conditions for the above reaction

1.1.3 Compare the NO conversion efficiency of selected catalyst namely Pt-Zeolite, Pt-Cu-Zeolite and V_2O_5-TiO_2

1.2 Scope of the work

In order to achieve the objectives mentioned in section 1.1., the reaction was carried out in a fixed-bed flow type reactor. Catalyst was packed in the reactor. NO, NH_3 and O_2 were employed as feed gases. They were mixed with diluent as helium, He, before being transferred to the reactor. Affluent gases were sampled to be further analyzed by gas chromatography. The variables studied in this research were catalyst compositions, reaction temperature, space velocity, and the presence of O_2 in feed gases.

1.3 Beneficiaries

This technique can be applied to decrease the amount of NO from stationary exhaust gases of power plant combustion and exhaust gases from industrial processes such as oil industry. Besides, it utilizes the idea of developing and selecting catalyst as filtermedia to control amount of NO from exhaust gases from the automobiles in the future.