CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The reduction of nitric oxide with carbonmonoxide was studied using differential flow reactor including steady-state reaction kinetics, BET surface area and particle size analyzer. Palladium on alumina catalysts have been prepared by impregnation technique. The results indicated that Pd loading and calcination temperature (1.0, 1.5 % and 500, 600, 700 ^{o}C) had no strong effect on surface area, pore radius and catalyst activity in this range. The BET surface area decreased slightly and the pore radius increased with the calcination temperature.

For the reaction studied, the reaction between nitric oxide and carbonmonoxide was selective towards production of nitrogen and carbondioxide with 2,000 ppm of both nitric oxide and carbonmonoxide concentrations in the feedstream. The carbonmonoxide order, at constant nitric oxide concentration of 10,000 ppm, was found to be -0.5 as the concentration of carbonmonoxide was increased from 1,000 - 2,000 ppm. In a similar fashion, the nitric oxide order, at constant carbonmonoxide concentration of 20,000 ppm, was found to be 1.0 as the concentration of nitric oxide was increased from 2,000 - 4,000 ppm. The inverse 0.5 order respect to carbonmonoxide is probably due to the blocking of surface sites for NO adsorption.

The temperature dependence of the reaction rate yielded an apparent activation energy of 65.44 Kcal/mole. This activation energy is three times for

the activation energy for CO oxidation by oxygen on the Pd (100) single crystal surface. This result also suggests that this reaction need lots of energy to occur on this catalyst and may not be suitable for the low temperature exhaust gas emissions. However, this catalyst has excellent selectivity to N_2. Other oxides of nitrogen (NO_2, N_2O, and so on) are produced in very low concentrations.

4.2 Recommendations

Future investigation of the reduction of nitric oxide with carbonmonoxide might include chemisorption, SEM or TEM analysis of a catalyst surface which can determine the number of active sites and Pd particle size distribution. The effect of oxygen, hydrocarbon, and water should be studied to observe the steady-state rate of reaction.