CHAPTER 1

INTRODUCTION

Methanol is a basic industrial chemical produced mainly via synthesis from CO and H_2. Besides use as solvent in many industrial processes, methanol yields numerous chemical derivatives and it is easy to store and transport. Therefore methanol synthesis is a process of major industrial importance. At present, most methanol is produced by catalytic hydrogenation of carbon monoxide under pressure, as follows :

$$CO + 2H_2 \longrightarrow CH_3OH$$

Several generations of catalysts have been developed. Zinc-chromium oxide was one of earliest commercial types used. Later, catalysts of mixed copper zinc oxide supported on chromium oxide or aluminium oxide were introduced commercially.

In the present work, a ternary catalyst of copper-zinc oxide supported on chromium oxide is used for methanol synthesis from one part of CO and two parts of H_2. The composition of the prepared catalyst is Cu : Zn : Cr = 31 : 38 : 10

The scope of the present work encompasses the following tasks.

1. Fabrication of a high-pressure through-flow tubular reactor (50 atg design pressure and 450°C design temperature)

2. Fabrication of a furnace set for reduction of catalysts with CO and H_2 in N_2 gas.

3. Preparation and reduction of a ternary catalyst (Cu : Zn : Cr = 31 : 38 : 10) for use in methanol synthesis experiments.

4. Carrying out methanol synthesis experiments to investigate the effects of temperature, pressure and space velocity on total CO conversion per pass, product selectivities and space time yields of methanol and dimethyl ether (DME)

5. Comparison of experimental results between the above ternary catalyst, another similar ternary catalyst (Cu : Zn : Cr = 2: 2 : 1)(W. Tanthapanichakoon, 1984) and an industrial binary catalyst of zinc and chromium oxide (Zn:Cr = 1.8-2.2:1)(S. Limtrakul, 1985).