

CHAPTER I

INTRODUCTION

In recent years, considerable attention has been paid to global warming which is the increasing in the earth's temperature. As the rising temperature contribute to melt the ice cap in Antarctica, the world sea level would rise several hundred feet, flooding most of the coastal cities and agriculture areas of the world. Temperature increases much smaller than those needed to melt the ice cap would cause agriculture areas become dryer and hotter. There are many reasons why the earth's temperature seems to be increasing. One of the main reasons is the greenhouse effect which is caused by the so called greenhouse gases. There are several types of greenhouse gases such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and chlorofluorocarbon (CFCs) (Davis and Cornwell, 1991). The contribution of these gases is illustrated as shown in Figure 1.1.

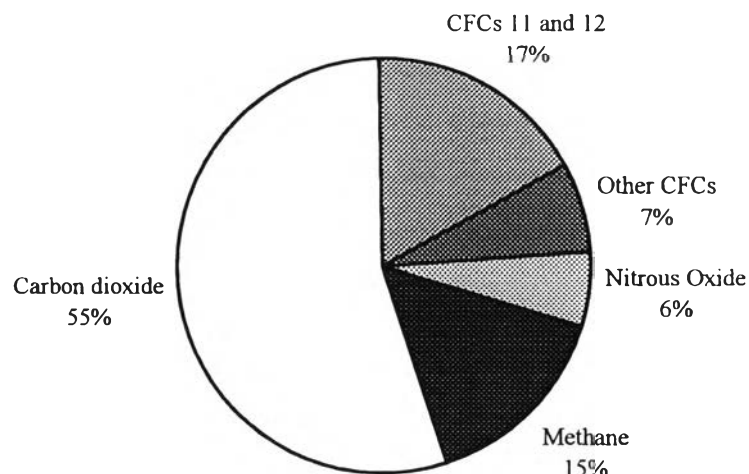


Figure 1.1 The contribution of greenhouse gases (Nevers, 1995).

Carbon dioxide in low concentrations has no short-term toxic or irritating effects. It is abundant in the atmosphere and is necessary to plant life. So, it has not been considered a pollutant. But the huge increase in the world resulting from CO₂ emission from the combustion of fossil fuels, added to worldwide destruction of forests, and the releases as a byproduct of many industrial processes has resulted in a steady rise in ambient CO₂ concentrations. These higher concentrations of CO₂ may lead to environmental problems (Benitez, 1993).

Methane is the one of the most abundant hydrocarbons in the world existing in the form of deep sea hydrates, large reservoirs in remote corners of the world, in garbage dumps and it is also the principal component of natural gas. Moreover, it is a potential environmental problem as it contributes to the greenhouse effect . Although most of the attention is focused on carbon dioxide, methane is also a significant contributor because it is 21 times more effective than carbon dioxide.

At present, in Thailand, methane is not used as a feedstock for petrochemical industries and is found together with carbon dioxide in many reservoirs in the Gulf of Thailand. The carbon dioxide content is generally as high as 20% [Gas separation plant officer, Personal Communication]. Due to the availability of both methane and carbon dioxide, methane reforming with carbon dioxide should be one of the most effective ways in utilizing these two greenhouse gases to produce more valuable products (methanol, formaldehyde or synthesis gas, CO+H₂), and substantially reduce their emissions to the atmosphere.

The research objectives of this thesis were

1. To study the feasibility of methane reforming with carbon dioxide to synthesis gas by using a tungsten catalyst.
2. To find the suitable conditions which enhance synthesis gas selectivity and prevents oxidation of products.

3. To study the feasibility of direct synthesis of methanol from carbon dioxide and methane.