CHAPTER I
INTRODUCTION

In petroleum industries, the primary products obtained from natural gas production is methane that is reserved in many sources over the world. Typically, natural gas contains 75-90% (Sivasankar. 2008) methane depended on sources which it is extracted. From the large production of methane, it is used primarily as a fuel for home, industrial heating and electrical power generation due to it has the largest heat of combustion.

Besides using methane for fuel field, many researches demonstrate that methane can be made for high value-added products in petrochemical industries by conversion of methane to higher hydrocarbon like ethylene. Which is the main product aimed to produce in this research.

There are several ways to convert methane to higher hydrocarbons. That can be affected via an indirect or direct route. The indirect route involves the production of hydrocarbons via intermediates formed from the reaction of methane with steam, oxygen, HCl, etc, whereas the direct route involves coupling of methane in the presence of oxygen (oxidative coupling of methane) or nonoxidative coupling (Choudhary *et al.*, 2003)

In spite of methane can be converted to higher hydrocarbon by many routes, indirect conversion has problem because hydrocarbon production by synthesis gas is expensive. Furthermore, oxidative coupling of methane will cause environmental problem from CO_x species formed due to the presence of oxygen in feed. Moreover, this route is performed in high temperature that basically use oxides promoted with alkaline metal salts and /or alkaline earth metal salts as catalysts that result in less C_2 hydrocarbon yield because of the hinder from CO_x species. Thus the development of conversion of methane to ethylene in this study will focus on nonoxidative coupling in the path of methane dehydrogenation and coupling to ethylene to avoid the oxidation of product and increasing ethylene yield.

The purpose of this work was to investigate the optimal conditions for enhancing the production of ethylene by methane dehydrogenation and coupling using Ni/HZSM-5 catalysts. The catalysts were prepared by polyol mediate process and the characteristics of catalyst were investigated by XRF, XRD, SEM, TPD, TPR and BET techniques. The effects of Ni loading, hydrofluorination, methane concentration and reaction temperature on the methane conversion and ethylene selectivity were studied.