CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The increasing demand for light hydrocarbon fuels is a major incentive to look for better and more economical means to convert heavy hydrocarbon fractions to light fuels. Hydrocracking process, reaction involving scission of carbon to carbon bonds plus hydrogenation, is one of the modern processes used widely in oil refineries today. Incidentally this process was commercially developed by I.G. Farben Industries in 1927 for converting coal tar into gasoline and was brought to the USA. by Esso Research and Engineering Company in the early 1930s for use in upgrading petroleum feedstocks and products.

Improved catalysts have been developed, which permit more economical operations at relatively low pressure. Meanwhile, the demand for high-octane gasoline and a decrease in the demand for distillate fuels have caused a necessity for converting higher boiling point petroleum fractions to gasoline and jet fuels. In addition, the hydrocracking of

low naphtha using specially developed catalysts is a scheme currently used to produce liquefied petroleum gas (LPG) in certain areas lacking natural gas.

The catalysts used originally for the hydrocracking reaction were sulfides of tungsten, nickel or molybdenum. These unsupported catalysts were later replaced with ones supported on acid-treated clay, which had a more balanced activity for cracking and hydrogenation.

Zeolites are crystalline aluminosilicates, having uniform interstitial pores consisting of three-dimensional networks of silicon, aluminum and oxygen atoms. Only molecules below a certain size can enter the pores and undergo reaction, so zeolites offer a highly selective and active family of catalysts. Naturally a great number of studies have been made on the catalytic activity of these catalysts in the past two decades.

1.2 OBJECTIVES

The main objective of the present work is to carry out a series of experiments on the hydrocracking of n-hexane using mordenite and Na-Y type zeolitic catalysts under various reaction conditions to provide some insight effects and performance of catalysts.

The main objective can be broken down into the following.

1. To crack n-hexane to smaller hydrocarbon molecules.
2. To investigate the heterogeneous process of the hydrocracking reaction of n-hexane on mordenite and Na-Y type zeolitic catalysts.
3. To develop the experimental technique necessary to carry out the experiments.
4. To investigate the effects of temperature, pressure and space velocity of hydrocracking of n-hexane on mordenite and Na-Y type.
5. To find the optimum conditions and select the more suitable zeolite catalyst of this reaction between mordenite and Na-Y type.

1.3 SCOPE OF WORK

The scope of the present work encompasses the following tasks.

1. Fabricate a tubular high-pressure reactor unit (design temperature : 400° C, design pressure : 100 atg)

2. construct a furnace for a reactor unit and find out its temperature profile in order to check the uniformity of the axial temperature distribution in the furnace.

3. Modify the catalysts (mordenite and Na-Y type zeolites) used in the experiments.

4. Carry out experiments to study the effects of temperature, pressure and space velocity of the reaction on mordenite and Na-Y type of zeolites.