CHAPTER 1

INTRODUCTION

Accordingly, the new developed routes for effective utilization of petroleum has become great siginificance, C_1 chemistry is one of these starting from compounds contained one carbon atom such as CO_2 , CH_3OH, CO and CH_4. Synthesis of aromatic hydrocarbons from methanol is one of the most important subjects of investigation in both chemistry and industry of hydrocarbons. A lot of attention has been paid to a catalytic process for the direct conversion of methanol to aromatic hydrocarbons. Aromatics especially benzene, toluene and xylene, can be utilized as a booster for the high-octane-number gasoline and they are important as fundamental raw materials in petrochemical industry.

Structurally, ZSM-5 is a crystalline aluminosilicate with a framework based on an extensive three-dimensional network of oxygen ions [1]. The pore structure of ZSM-5 leads to various shape selectivities; of reactants, of products and of transition-states. Hence, it is important to investigate the performances of catalysts having the same structure as ZSM-5 for various reactions. The replacement of Al ions in ZSM-5 with various kinds of metal ions would greatly modify the nature of active sites [2]. Metals incorporated in metallosilicates changed the acid-property of zeolite, consequently, it is expected that the catalytic performances of metallosilicates were widely changed by the kind of metal [3]. A considerable number of investigations have disclosed the incorporated Fe, Ga and Zn into the framwork of H-ZSM-5. Fe-silicate was effective the selectivity of catalyst for the conversion of

methanol to C_2-C_4 olefins, while, H-Ga-Silicate and H-Zn-Silicate were effective for the conversion of methanol to aromatic-rich gasoline[4]. Besides, it was found that compared with H-ZSM-5, Ga and Zn ion-exhanged H-ZSM-5 catalyst evidently increased the selectivity to aromatics-rich products from methanol [3].

There is a serious problem of methanol conversion process because of coke information which usually leads catalysts to rapid deactivation. The combination of Pt on metallosilicate brought a marked moderation of catalyst decay owing to coke information [4].

Therefore, this work aims to investigate the performances of various metals containing on ZSM-5 catalyst for aromatic selectivity on methanol to gasoline reaction. The optimum catalyst for methanol conversion reaction as well as proper condition were studied.

The Objective of This Study

1. To study the preparation method of metal containing MFI-type zeolite catalysts.
2. To characterize the prepared catalysts.
3. To investigate the performance of the prepared catalysts on methanol conversion to aromatics.
4. To observe the stability of the prepared catalysts.

The Scope of This Study

1. Study the method to introduce metals such as iron, zinc into MFI-type zeolite catalyst either by ion-exchange or incorporation.
2. Study the characterization of the prepared catalysts by following methods:
   - Analyzing shape and size of crystallites by Scanning Electron Microscope, SEM.
   - Analyzing surface areas of catalysts by Brunauer-Emmett-Teller(BET) Surface Areas Measurement.
   - Analyzing the acidity of the catalysts by NH3-Temperature Programmed Desorption, NH3-TPD .
3. Investigate the performance of the prepared catalyst on the methanol conversion to aromatics under the following condition:
   - Atmospheric pressure
   - Reaction temperature 350-600 ^{0}C
   - Space velocity 2,000-8,000 h^{-1}
   - 20% methanol and 80% nitrogen, as diluent

   The reaction products were analysed by Gas Chromatographs.
4. Study the effect of platinum on the life of the prepared catalysts.