

CHAPTER I

INTRODUCTION

Currently, conversion of glycerol to aromatic hydrocarbons has received much attention due to the limited petroleum resources and heavy demand of aromatic hydrocarbons. The worldwide increase in biodiesel production via the transesterification reaction from vegetable oils and animal fats is leading to a continued increase in the glycerol supply to the market and also decrease in the glycerol price. A profitable way to increase the value of the glycerol present in such petroleum feedstock is to transform them directly into aromatic products which have a various applications in the petrochemical industries. Aromatic compounds, especially benzene, toluene and xylenes are valuable raw materials in the chemical industries. HZSM-5 is well known for its activity for conversion of alcohol and other oxygenates into aromatic hydrocarbons (Ni *et al.*, 2010). There are many processes relate to this work such as Methanol to Gasoline (MTG), Methanol to Olefin (MTO) and Ethanol to Gasoline (ETG). In order to develop a new process for aromatic hydrocarbon production replace crude oil, catalytic aromatization of glycerol has a great attention and potential.

p-Xylene is the aromatic used as a raw material for terephthalate and polyester. The selective formation of *p*-xylene in the disproportionation of toluene and aromatization of *n*-alkane has been studied over acidic zeolites, especially ZSM-5 because its pore size is suitable for separating *p*-xylene from a mixture of xylene isomers. The concentration of xylene isomers are typically close to the thermodynamic equilibrium with 24% *o*-xylene, 53% *m*-xylene and 23% *p*-xylene over unmodified ZSM-5 zeolite due to the quick isomerization of *p*-xylene to *o*- and *m*-xylene on the external acid sites. Therefore, the external surface modifications of the ZSM-5 zeolite are required to enhance the *p*-xylene selectivity. The deposition of an inert silica layer (which has molecular size larger than the pore mouth of ZSM-5) onto the external surface of the zeolite crystals, can be achieved by chemical vapor deposition (CVD) and chemical liquid deposition (CLD) methods. In contrast, CLD is more easily transferred to industrial scale. After CLD treatment, *p*-xylene

selectivity is enhanced due to the elimination of external acid sites (Teng *et al.*, 2011).

The objective of this work is to investigate the catalytic performance of glycerol conversion to aromatics hydrocarbon by studying the reaction pathway for this reaction. Optimization *p*-xylene product over ZSM-5 zeolite catalysts by silylation modification. The silylation will be performed by chemical liquid deposition (CLD). Degree of silylation, cycle of deposition and the effect of SiO₂/Al₂O₃ ratio of HZSM-5 will be studied.