

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

From this work, it can be concluded that the activity of the catalytic cracking investigated with individual compounds, i.e., *n*-butane, 1-butene, *i*-butene, *n*-pentane, and mixed C₄ feedstocks depends on type of reactant. The experimental results showed a conversion decrease in the order of 1-butene > *i*-butene > mixed C₄ and *n*-butane ~ *n*-pentane. It was found that methane, ethane, ethylene, propane, propylene, and butene (1-and 2-butene) were detected as the cracking products. No aromatic products (BTX; benzene, toluene, xylene) were observed. The major source of coke formation over the catalyst might be C₄ olefin species due to the highly reactive olefins oligomerization. After 12 h of reaction time at the temperature of 600°C with the conditions of space velocity = 21,220 h⁻¹, it appears that the different peaks that we observe in TPO are not due to different forms of carbon, but rather to different locations on the catalyst surface. Although the maximum oxidizing temperature according to TPO profile is about 700°C, the catalyst can be recovered its initial activity by regeneration in oxygen at temperature of 500°C.

The aromatization reaction of mixed C₄ feedstock was investigated over ZSM-5 with Si/Al ratio = 18. It can be summarized that the conversion and product selectivities depended on temperature and space velocity. At 480°C reaction temperature, the catalyst is stable after prolonged operation of the catalyst for 18 h. Increase in space velocity decreased the conversion and the selectivities of aromatic products whereas the selectivities of unsaturated compounds such as ethylene and propylene increased. The presence of H₂ in the feed resulted to reduce the mixed C₄ conversion and the selectivities of aromatic products.

The effect of metal loading was also investigated in aromatization reaction. In this work, Ag and Ga were selected. It was found that the metal supported catalysts exhibited higher conversion than ZSM-5. It seems to be that Ag promoted cracking reaction whereas Ga promoted aromatization reaction.

5.2 Recommendations

In this work, it appears that the different peaks that we observed in TPO are not due to different forms of carbon, but rather to different locations on the catalyst surface. However, the new development of characterization methods such as UV Raman spectroscopy and X-Ray photoelectron spectroscopy to identify the location of coke should be clarified.

The next important study is the life cycle time of the catalyst. In this work, the life cycle time of the catalysts on catalytic cracking was study while that on aromatization was not investigated. Therefore, the catalyst need to test for number of life cycle time by bringing the after regeneration catalysts to test for activity and stability on the aromatization.

We know that Ag slightly promoted cracking reaction whereas Ga promoted aromatization reaction. The effect of higher amount of metal loading should be further investigated.