

## CHAPTER V

### CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Conclusions

The following conclusions are drawn from this study:

1. The addition of 10 ppm sulfur as sulfur compounds affects catalytic reforming of n-hexane on Pt-Re/ $\gamma$ -alumina. Conversions of n-hexane and methylcyclopentane are decreased. Weight percent of isomer products and benzene are also decreased. In contrast, weight percent of cracking products and higher aromatics are increased. Sulfur compounds are reversible poison.

2. The poisoning effects of sulfur compounds on n-hexane reforming depend upon the nature and type of sulfur compounds as follows:

2.1) Comparison of structure of sulfur compounds, straight chain sulfur compound (ethyl sulfide) and cyclic sulfur compound (thiophene), shows that straight chain sulfur compound has stronger effect (as described in 1.) than cyclic sulfur compound because straight chain sulfur compound dissociates easier than cyclic compounds when it is adsorbed on the metal sites.

2.2) Comparison of number of sulfur atom of sulfur compounds, methyl sulfide ( $\text{CH}_3\text{-S-CH}_3$ , 1 sulfur atom) and methyl disulfide ( $\text{CH}_3\text{-S-S-CH}_3$ , 2 sulfur atoms), shows that no difference on the catalytic reforming reactions of n-hexane is observed for these two sulfur compounds due to their similar bonding in the structure.

2.3) Comparison of number of carbon atom (similar bond) of sulfur compounds, methyl sulfide ( $\text{CH}_3\text{-S-CH}_3$ , 2 carbon atoms) and ethyl sulfide ( $\text{CH}_3\text{-CH}_2\text{-S-CH}_2\text{-CH}_3$ ), 4 carbon atoms), indicates that ethyl sulfide has stronger effect (as described in 1.) than methyl sulfide because ethyl sulfide dissociates easier than methyl sulfide when it is adsorbed on the metal sites due to its larger structure.

2.4) Comparison of number of carbon atom (different bond) of sulfur compounds, carbon disulfide ( $\text{S=C=S}$ , 1 carbon atom) and methyl disulfide ( $\text{CH}_3\text{-S-S-CH}_3$ , 2 carbon atoms), shows that carbon disulfide has stronger effect (as described in 1.) than methyl disulfide because carbon disulfide has higher chance to adsorb on active sites with its molecule due to its stronger bonds.

## 5.2 Recommendations

Recommendations for future studies and research are as follows:

1. A similar study should be conducted using another type of hydrocarbon feed to find the reaction network.
2. The other sulfur compounds should be chosen which more different than this study in nature and type. For example, the effects of number of carbon atom should be compared between 2 carbon atoms compound and 10 carbon atoms compound.
3. A similar study should be carried out at wider range of concentration of sulfur compounds.
4. The effects of other compounds such as metallic compounds should be studied.
5. The effects of amount of catalyst should be studied.