

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

To improve *p*-xylene yield among aromatic products, the HZSM-5 catalysts were modified by steaming, acid leaching, Ga ion-exchange and silylation. The results showed that the HZSM-5 modified by pre- and post-acid leaching of the steaming condition (400 °C, 5 kPa) followed by Ga ion-exchange and silylation, denoted as CLD/Ga/Ac/ZP5, exhibited the highest activity among other modified HZSM-5 catalysts. The CLD/Ga/Ac/ZP5 catalyst in powder form was shaped in cylindrical extrudates. After shaping, *p*-xylene selectivity in xylenes decreased because of *p*-xylene isomerization at the gamma-Al₂O₃ binder. By using temperature programmed desorption of isopropylamine (TPD-IPA) and BET surface area analyzer, the extruded CLD/Ga/Ac/ZP5 catalyst had a lower both of Brønsted acidity and surface area than its powder form. On the other hand, the spent extruded CLD/Ga/Ac/ZP5 catalyst had lower coke formation than spent powdery CLD/Ga/Ac/ZP5 catalyst. This could be due to the lower diffusion limitation of the mesoporous matrix material.

5.2 Recommendations

The modifications of HZSM-5 catalysts improved aromatic yield, *p*-xylene selectivity in xylenes, and stability comparing with unmodified HZSM-5 catalyst. After shaping catalyst, the extruded HZSM-5 catalysts performed lower *p*-xylene selectivity in xylenes. Therefore, the next work could find treatments to remove unwanted acid sites at gamma-Al₂O₃. It would improve *p*-xylene selectivity by preventing *p*-xylene isomerization reaction. In addition, the type of acids and binders would be further studied.