



CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

An autoclave reactor was used to study the catalytic pyrolysis of waste tires. The pyrolytic and catalytic temperatures were fixed at 500 °C and 300 °C, respectively. In this study, the bimetallic catalysts, Pd and Pt loaded on the Y-zeolite, were used to investigate the effect of metal ratio (α_{Pd}) and catalyst preparation method. The metal ratio of Pd/Pd+Pt (α_{Pd}) was varied of 0, 0.2, 0.4, 0.6, 0.8, and 1 with 1 %wt of total metals. Moreover, two catalyst preparation methods, successive and co-impregnation were applied.

The results showed that the synergy between Pd and Pt of bimetallic catalysts had the effect on the quantity and quality of pyrolytic liquid products such as the amount of liquid, saturated hydrocarbons, naphtha fractions due to the structural effect and chemical effect. Particularly, the catalysts prepared by successive impregnation with loading Pt first at $\alpha_{Pd} = 0.2$ and 0.8 produced the oil products, which contain the highest saturated hydrocarbons and the lowest sulfur and aromatic contents. Unfortunately, for gas production, the bimetallic catalysts had not shown the synergistic effect. Thus, the bimetallic catalysts were not suitable to produce gas.

The Pd-Pt*/Y catalysts at $\alpha_{Pd} = 0.2$ and 0.8 consist of the monometallic species as well as and new species generated from weak bimetallic interaction. Furthermore, these particular catalysts also exhibited high metal dispersion and wide size distribution which could affect the hydrogenation and hydrogenolysis activity. After pyrolysis, both catalysts contain low sulfur and coke deposition. Consequently, these particular catalysts provided the highest catalytic activity and the lowest catalyst deactivation.

5.2 Recommendations

According to the results, the bimetallic catalysts had high hydrogenation and hydrogenolysis activity. In the future, the liquid product should be analyzed following standard petroleum method for both physical and chemical properties to evaluate their quality and capability for being used as transportation fuel. This work fixed the operating conditions. Furthermore, the further experiments should be done to find the optimum condition of parameters such as catalytic temperature, catalyst per tire ratio, types of tire etc. Moreover, the Pd and Pt bimetallic catalysts have high sulfur tolerance; therefore, the life cycle of catalysts should be studied.