CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In this work, further investigation on two different Si/Al ratios of Pd/Beta active component and two different kinds of natural clay matrix (bentonite and ball clay) were studied. The extrudate compositions at various percentages of active component (5, 20, and, 40 wt %.) in a presence of alumina binder (10 wt %.) and a matrix were investigated on the catalytic pyrolysis of waste tire to find the optimum product yields and compositions.

It was found that the use of pure Pd/Beta which has a low Si/Al ratio (high acid density) tended to promote the secondary reactions according to the greater acid sites available on the catalyst. Concerning the liquid part, the employment of both catalysts with different Si/Al ratio significantly enhanced the concentration of naphtha in the oil product. However, no significant difference was found on the naphtha fraction upon the variation of Si/Al ratio of the Beta zeolite support. Additionally, the higher acid density and metal dispersion of Pd/Beta with the (Si/Al = 13.5) also resulted in the higher saturated hydrocarbons content in the tire-derived oil. In the case of pure matrixes (Bentonite and ball clay), it was found that both clays were not inert, or catalytically inactive as they can possess some mild cracking activity, which resulted in a higher concentration of light fraction in the oil product. In comparison of both types of clays, the bentonite clay was found to have a slightly higher cracking activity as more light oil fraction was produced.

In a series of compounded catalysts, all the extrudates exhibited a higher proportion of naphtha production as compared to the case of pure matrixes and the pure active components. The synergistic effect between the mild cracking activity of the meso-porous clay matrix and the cracking activity of active component may possibly exist. The best extrudate composition, which provided the highest concentration of naphtha in the oil product, was found to be 20 wt. % of active Pd/Beta zeolite (Si/Al = 250), 70 wt. % of bentonite, and 10 wt% of α-alumina. Moreover, this extrudate also gave the maximum yield of the overall naphtha produced from the cata-

lytic waste tire pyrolysis. Therefore, it is reasonable to conclude that this composition is the best compounded composition for the production of naphtha range product. However, in terms of chemical composition, the extrudated catalysts in a series of Pd/Beta (Si/Al = 13.5) tended to promote a slightly higher concentration of saturated hydrocarbons in the oil product.

5.2 Recommendations

The catalysts shall further be tested in a practical continuous process to confirm their activity, selectivity, and stability of the product of waste tire pyrolysis. Moreover, the effect of catalytic condition shall be studied in order to maximize the process efficiency at all aspects.