CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The waste tire pyrolysis was carried out in the bench-scale autoclave reactor at the atmospheric pressure. The bi-functional catalyst, which was fixed the amount of Pd at 1 wt%, was prepared by incipient wetness impregnation technique, whereas the additive was physically mixed with the main catalyst at 10 wt% and 20 wt%. All catalysts were sieved in the range of 40-60 mesh and placed in the upper zone (catalytic zone) of the reactor. The other parameters such as 20-40 mesh particle size, 30 g of sample, 7.5 g of catalyst, 90 min holding time, and 30 ml/min nitrogen flow rate were fixed in every test.

It was found that the bifunctional catalysts (both Pd/HBETA and Pd/HY) raised the total-aromatics content in naphtha fraction, which can be used as feedstock for aromatics separation or blended in a low aromatics-containing gasoline pool. In addition, they also enhanced the quality and quantity of kerosene and gas oil fractions as compared to the non-catalytic case. The addition of HY in Pd/HBETA reduced the cracking activity resulting to the reduction of naphtha quantity. However, the quality and quantity of gas oil fractions were improved instead, especially when 20 wt% HY was added in Pd/HBETA. Moreover, it enhanced the yield of light olefins, which was caused by the synergy effect occurred by the addition. The addition of 10 wt% HBETA in Pd/HY improved the yield of valuable gaseous products (light olefins and cooking gas). It is contributed to the high cracking activity. Moreover, the 1PY10B catalyst can enhance full range naphtha in the liquid product, which contains a higher concentration of saturated hydrocarbons than that obtained from Pd/HY. Hence, it can be used as feedstock for cracking process. The further addition of HBETA to 20 wt% suppressed the cracking activity resulted in a lower G/L ratio and an increase in heavy fractions.

The addition of HZSM-5 as a second additive in the selected catalysts (1PB20Y and 1PY10B) enhanced the quantity of full range naphtha. In addition, the quality of this fraction was found also improved because they increased the

concentration of saturated hydrocarbons. These results reflected the very strong acid strength and small pore diameter of HZSM-5, which selectively produced the small saturated hydrocarbons compounds. Furthermore, the quality of naphtha fraction obtained from 1PY10B10Z is close to that of 1PB20Y20Z. However, the 20 wt% HZSM-5 addition in 1PB20Y also improved the quality of kerosene fraction by increasing saturated hydrocarbons and reducing total aromatics contents in kerosene.

5.2 Recommendations

According to the results, the products should be further tested in order to study the characteristic of saturated hydrocarbons and aromatics, especially in naphtha fraction. Meanwhile, the catalysts should be improved for using as industrial catalysts. Moreover, the study on composite catalysts affecting to the pyrolysis products is another interesting case that should be further conducted for the next research.