CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The valuable petrochemical products can be produced by the pyrolysis of waste tire, which was performed in a bench-scaled autoclave reactor to investigate whether a non-noble metal (Ni and Fe) could be used as a substitute for a noble metal (Pd and Ru) supported on acid zeolites (HBeta and HMOR). The catalysts were prepared by impregnation technique with a fixed 1 wt% of a noble metal (Pd and Ru) loading and 5-20 wt% of a non-noble metal (Ni and Fe).

So as to reduce the cost of catalyst, a non-noble metal has potential to substitute a noble metal that is a costly metal. Since Ni and Fe are an element in the same group (VIIIB group) as Pd and Ru in the periodical table, and has a low price. From the results, 5%Ni/HBeta can be used as a substitute of 1%Pd/HBeta as a naphtha-producing catalyst since it produced the similar quantity of full range naphtha as 1%Pd/HBeta. Moreover, 5%Ni/HBeta produced the good quality of petroleum oil, which contained a high sat HCs/total aromatics ratio and a low sulfur content in oil. However, all Ni/HBeta catalysts cannot be used as a substitute of 1% Pd/HBeta for mono-aromatics production. With using HMOR as a support, the Ni/HMOR catalysts with the high Ni loading (20%) showed as high cracking and hydrogenation activity as that of 1%Pd/HMOR. The 20%Ni/HMOR catalyst can then be used as the substitute of 1%Pd/HMOR for the production of comparable tire-derived oils since it can produce the similar quality and quantity of petroleum cuts (with a lower sulfur content) to that of 1%Pd/HMOR. Moreover, only 5%Ni loaded on HMOR zeolite can produce a seven times higher yield of light mono-aromatics (BTXs) than that of 1%Pd/HMOR. Additionally, the petrochemical production by 1%Ru/HBeta can be substituted by using 10%Fe/HBeta since it can produce the higher yields of light olefins, cooking gases, and mixed C_4, than those of 1%Ru/HBeta. Moreover, 10%Fe/HBeta produced three times higher light mono-aromatics (BTXs) than those of 1%Ru/HBeta. Similarly, 20%Fe/HMOR can be used as a substitute of 1%Ru/HMOR for petrochemical products since it can produce the

closest yields of light olefins, cooking gases, and mixed C_4; moreover, it gave 20 times higher yield of light mono-aromatics (BTXs) than that of 1%Ru/HMOR. This result is attributed to the iron (bifunctional) catalysts that enhanced the secondary reactions, including the oligomerization of light olefins and aromatization.

5.2 Recommendations

For the future experiments, the percentage of non-noble metal loaded on acid zeolites can be varied in narrower range to obtain the specific percentage loading, which can be used as a substitute noble metal catalyst. The other types of support such as mesoporous, base zeolite, and other acid zeolite seem to be interesting as well as the further study about the utilization of valued products.