

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The pyrolysis of scrap tire was performed in a bench-scaled autoclave reactor with fixing the parameters namely, particle size of tires, holding time, N₂ flow rate, heating rate, temperature in pyrolysis zone, temperature in catalytic zone and the ratio of tire per catalyst as 8-18 mesh, 30 min, 30 ml/min, 10 min/°C, 500°C, 350°C and 25% (tire: 30 g per catalyst: 7.5 g), respectively. The effect of amount of silver loading, the effect of different zeolites loaded with silver, and the effect of bimetallic catalysts (Pd-Ag/HMOR) on pyrolysis products were investigated.

The amount of Ag loaded on Y zeolite had the influence on pyrolysis products. 1%Ag/Y zeolite gave the highest cooking gas production. Approximately 2.9 times higher cooking gas was obtained as compared to that from the non-catalytic pyrolysis. It also gave the highest gas production and mono-aromatics contents in the oil products. 2% and 3%Ag/Y gave a high long residue fraction in the oil products (indicating the negative effect on the oil products). The increase of silver loading decreased kerosene fraction whereas gas oil fraction increased. 2% and 3%wt of silver loading gave a higher long residue fraction and a lower naphtha fraction than 1%Ag/Y. For the desulfurization effect, increasing the amount of Ag onto Y zeolite decreased desulfurization activity.

It was shown that zeolites, which had high acid strength, gave high cooking gas and full range naphtha production. One-dimensional structure of zeolites gave the high amount of total aromatics. Zeolites, which had three-dimensional structure, in turn gave the high amount of saturated hydrocarbons. Ag-loaded acid zeolites (Y, BETA, and HMOR) had the negative effect on the oil product because they gave a high amount of gas oil and long residue. All of 1%Ag-loaded zeolites gave a low sulfur concentration in oil. However, 1%Ag/HMOR catalyst showed the highest performance in sulfur removal capacity, because it gave the lowest concentration of sulfur in the oil product as compared to the other catalysts.

The bimetallic catalysts (Pd-Ag/HMOR) gave the lower saturated hydrocarbons as compared to monometallic catalysts (1%Ag/HMOR and 1%Pd/HMOR). They also showed lower efficiency in catalytic cracking, had the negative effect on liquid products, and had low desulfurization activity. 1%Ag/HMOR was the best among all catalysts in terms of desulfurization of oils obtained from waste tire pyrolysis.

5.2 Recommendations

For the further experiment, the amount of sulfur in gas product should be investigated. Moreover, the types of sulfur compounds should be determined by other techniques such as GC-MS and NMR.