CHAPTER V

CONCLUSION

Styrene waste, that has no market value, was obtained from polystyrene manufacturing. This study was aimed to add value of styrene waste. Benzaldehyde, benzoic acid, and benzyl alcohol are higher value than the waste; therefore it was possible to developed this process for commercial purpose.

Benzaldehyde was synthesized from styrene waste by ozonolysis and followed by reduction reaction. The first step was occurred in dichloromethane at 0°C. Then, ozonolysis products were reduced with zinc-acetic acid mixture. It was found that the optimum condition was the reaction performed in 50% acetic acid solution with the mole ratio of zinc to styrene at 1:3, and refluxing for 2 hours. The yield of benzaldehyde, obtained by weight of benzaldehyde-p-nitrophenylhydrazone derivative, was 96%.

Benzoic acid and benzyl alcohol were synthesized from styrene waste by carried out ozonolysis in methanol at 0°C. The ozonolysis product was oxidized with acetic acid and hydrogen peroxide. It was concluded that the optimum conditions were the reaction performed with the mole ratio of styrene to hydrogen peroxide at 1:1, mole ratio of hydrogen peroxide to glacial acetic acid at 1:1, and refluxing for 1 hour (60 % yield).

In order to synthesize benzyl alcohol, the ozonolysis products was reduced by two-steps catalytic hydrogenation over 10%Pt on activated charcoal catalyst. The observed optimum condition for hydrogenation was perform on 10% catalyst by weight to styrene waste. The first step of hydrogenation

occurred at 15°C, 50 psig H_2, and 1 hour and the second step was carried out at 75°C, 200 psig H_2, and 2 hours (60%).

Suggestion for further work

Due to the fact that a large amount (~30%) of ethyl benzene was presented in styrene waste, the hydrogenation reaction of styrene waste to ethyl benzene was interesting. Ethyl benzene is used as a solvent and as a starting material for other synthesis, therefore, conversion of styrene waste to ethyl benzene is an alternative way to solve styrene waste problem.