CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The hydrogenation of oxygen-containing C4 compounds namely, methyl butyrate, butyric acid, butanal, and n-butanol, were used as a model compound over two commercial catalysts, Pd/C and $NiMo/Al_2O_3$ in order to understand the reaction pathways and effect of reaction parameter (reaction temperature and reaction pressure) on product distribution of each catalyst. From the experimental results, it can be concluded that Pd/C was highly selective to hydrodecarbonylation reaction resulting in C_3/C_4 ratio higher than 1, while $NiMo/Al_2O_3$ was selective to hydrodeoxygenation reaction resulting in C_3/C_4 ratio was lower than 1. Reaction temperature affects both Pd/C and $NiMo/Al_2O_3$ in the same way, that is, conversion of reactant was increased with reaction temperature. But adversely for the ratio of C_3/C_4, since C_3/C_4 ratio of Pd/C was significantly increased with reaction temperature revealed that reaction is prefer hydrodecarbonylation path at elevated reaction temperature, while that of $NiMo/Al_2O_3$, insignificantly change was observed. However, the selectivities to condensed products which are dibutyl ether and butyl butyrate were found to decrease with reaction temperature whereas selectivities to ketonic decarboxylated products, heptane and 4-heptanone were slightly increased on both catalysts. The reaction pressure adversely affects the conversion of Pd/C and $NiMo/Al_2O_3$, that is, conversion of reactant tends to decreased with reaction pressure for Pd/C, while it found to increased for $NiMo/Al_2O_3$ (except for n-butanol). However, selectivities to condensed products which are dibutyl ether and butyl butyrate were increased with reaction pressure on both catalysts. Nevertheless, reaction pressure affects C_3/C_4 ratio in similar trend, that is, C_3/C_4 ratio was decreased with reaction pressure by increasing in hydrodeoxygenation path, while suppressed hydrodecarbonylation path, especially in case of Pd/C.

5.2 Recommendations

In this study, the mechanism pathways of hydrogenation of oxygen-containing C4 compounds over Pd/C and $NiMo/Al_2O_3$ were proposed and the effect of reaction temperature and reaction pressure were also studied. Since, the different in product distribution was observed over different catalyst, it is crucial to understand the nature of each catalyst so that catalyst characterization is essential for further study. However, the kinetic behavior of hydrogenation over Pd/C and $NiMo/Al_2O_3$ catalysts is also interesting for further study, for purpose of optimization and improvement of renewable diesel production from bio-oils.