CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In the present study, the effect of catalyst supports on the deoxygenation of beef fat for the production of hydrogenated biodiesel was investigated over Pd-based catalysts (i.e. Pd/Al_2O_3, $Pd/F-Al_2O_3$, Pd/SiO_2, Pd/TiO_2, Pd/C, and Pd/KL) and NiMo-based catalysts (i.e. $NiMo/Al_2O_3$, $NiMo/F-Al_2O_3$, $NiMo/SiO_2$, $NiMo/TiO_2$, $NiMo/C$, and $NiMo/CeO_2-ZrO_2$). The different catalysts gave the different conversions and product distributions. There were two main groups of liquid products which were hydrocarbons and oxygenate (fatty acids, fatty alcohols, and fatty esters). The results showed that hydrocarbons obtained from all catalysts were in the range of diesel fuel. The catalysts support affected the catalyst surface area, metal dispersion, but not the reaction pathway. The main hydrocarbons product obtained over all Pd catalysts were n-heptadecane (n-C17) and n-pentadecane (n-C15), resulting from hydrodecarbonylation. On the other hand, the main hydrocarbons product obtained over all NiMo catalysts were mainly n-octadecane (n-C18) and n-hexadecane (n-C16), resulting from hydrodeoxygenation. The intermediates were also detected such as hexadecanol, palmitic acid, stearic acid, heavy esters and monoglyceride. Among Pd supported catalysts, Pd/TiO_2 gave the highest hydrocarbon yield and conversion, due to the high dispersion of Pd on TiO_2 support. Pd/C also gave the high conversion resulting from a large cluster of Pd on carbon. For NiMo supported catalysts, they all gave the complete conversion. Activity of $NiMo/CeO_2-ZrO_2$ was obviously low, resulting from the high amount of coke deposition and the low surface area. From this work, TiO_2 showed the high activity to be the promising support for on the deoxygenation of beef fat. The supports affected the properties of catalyst, such as surface area and metal particle size, but did not significantly change the reaction pathway. Thus, we conclude that support catalyst has the effect on the deoxygenation of beef fat for the production of hydrogenated biodiesel.

5.2 Recommendations

- Among Pd-supported catalysts, Pd/TiO_2 showed the highest conversion and selectivity to hydrocarbons in the range of biodiesel. The different preparation methods and the reaction condition should be study in the further work for purpose of optimization and improvement of hydrogenation biodiesel production from beef fat.

- In this study, beef fat was used as the feedstock to study the production of hydrogenation biodiesel. There are many kinds of animal fat which could be used in this reaction. Therefore, the study of various feedstocks is interesting idea.