CHAPTER V
CONCLUSIONS AND RECOMMENDATION

In this work, the production of renewable diesel via the deoxygenation of palm oil over $NiMo/Al_2O_3$ and Pd/C catalysts was done under various temperatures, pressures, H_2/feed molar ratios, and liquid hourly space velocities. Palm oil can be hydrodeoxygenated on the $NiMo/Al_2O_3$ and Pd/C catalysts under moderate conditions and it was converted with high selectivity to paraffinic hydrocarbon that have carbon number in diesel range (C15 to C18 hydrocarbons). Over $NiMo/Al_2O_3$, palm oil was converted with high selectivity to long chain alkanes with carbon atoms equivalent to the carbon atoms of fatty acids in each oil molecule that are n-octadecane (n-C18) and n-hexadecane (n-C16), indicates that the deoxygenation of palm oil over the $NiMo/Al_2O_3$ prefers to occur via hydrodeoxygenation. In the case of the Pd/C catalyst, major fraction obtained from palm oils are n-heptadecane (n-C17) and n-pentadecane (n-C15), an alkane products that have one carbon atom less than the original fatty acids in each oil molecule, indicates that the deoxygenation of palm oil over the Pd/C tends to undergo hydrodecarbonylation pathway. Moreover, the corresponding fatty acids and fatty alcohols (hexadecanol, octadecanol, hexadecanoic acid, and octadecanoic acid) were observed as intermediates of the reaction. In consideration of reaction parameters, on both catalysts, the selectivity to total paraffinic hydrocarbons (n-C15 to n-C18) increased with contact time (1/LHSV), reaction temperature, reaction pressure, and H_2/feed molar ratio that is corresponds to decreasing in selectivity to intermediate products. At the reaction temperature above 325°C, the reaction trends to undergo thermal cracking.

For long term stability testing of the $NiMo/Al_2O_3$ catalyst, the stability of the catalysts was satisfactory under the studied conditions as revealed in the conversion and product distributions. As well, n-octadecane (n-C18) and n-hexadecane (n-C16) are favorable to be produced compare to n-heptadecane (n-C17) and n-pentadecane (n-C15).

For further studies, since $NiMo/Al_2O_3$ and Pd/C catalysts have high selectivity to alkane products that have carbon number in the range of diesel fuel but it would be beneficial if the specific product and desired properties of the fuel could be obtained. For example, in diesel fuel, if n-C18 and n-C16 could be produced from the corresponding fatty acids of vegetable oils, we could improve properties and cetane number. Therefore, the optimum conditions and selective catalyst for the production of renewable diesel with desired properties should be investigated and the stability testing of the catalyst should also be investigated.