



CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

A heterogeneous catalyst CaO–ZnO can be used as a solid based catalyst for biodiesel production via transesterification of palm oil. The Ca:Zn atomic ratio 1:3 catalyst gave highest biodiesel yield of 78.88% and 79.62% for CP and IWI techniques, respectively, at 60 °C, reaction time of 8 h, a 1:15 molar ratio of palm oil to methanol, a catalyst amount of 6 wt%, and 300 rpm of stirrer speed. During the three cycles of catalyst's durability observation, the durability of the CaO–ZnO catalyst prepared by IWI technique was much better than that of catalyst prepared by CP technique. It was found that the CP catalysts were less catalytically active than IWI catalysts in the stability test and Ca leaching significantly affected the changes in chemical-physical properties of the catalysts.

5.2 Recommendations

In order to better understand in the field of catalyst, the regeneration of heterogeneous catalyst should be much attention in the next study. The authors recommended the appropriate technique that could activate or recover the spent catalyst in order to yield more methyl ester contents. Tracing for the new type of heterogeneous catalyst with high stability and low-cost should be also considered.

In the part of transesterification process, it is very interesting to up-scale from the batch reactor to the fixed-bed reactor, or to operate the conditions closely to those in an industry. Besides, the extent of the contact time is attractive for this application. For instance, the reduction of feed flow rate, the higher amount of catalyst, and the longer of catalyst bed are totally involved in this parameter.