



CHAPTER V

CONCLUSIONS

The experimental results demonstrated that the optimum conditions for transesterification reaction of canola oil with methanol using NaOCH_3 are 0.59 wt% of catalyst concentration, 6:1 methanol/oil molar ratio, 90 °C for a biodiesel yield higher than 90% after 20 minutes of reaction time. Less soap formation was observed when the alkaline catalyst concentration was minimized. In the case of TBD, the optimum reaction conditions are 2.29 wt% catalyst concentration, 3.5:1 methanol/oil molar ratio, 60 °C for a biodiesel yield of more than 90% after 20 min of reaction time. While, the highest reaction conversion was reached using 5.00 wt% SrO , 6:1 methanol/oil molar ratio, 90 °C which renders a biodiesel yield of more than 94% after 10 min of reaction time.

Based on the results, TBD has the same catalytic activity that NaOCH_3 . However, it takes more catalyst concentration than NaOCH_3 . On the other hand, TBD can be operated under mild condition and provides a clean transesterification process in terms of easy of phase separation (glycerine). Moreover, the guanidinium salts of the fatty acids, present in small amounts in the oil, are soluble in the reaction mixture and do not form soaps or emulsion as indicated by Schuchardt et al. (1995). SrO seems to have the best activity but it takes a lot more catalyst concentration than TBD and NaOCH_3 . However, as heterogeneous catalyst, it has the potential to be reused, which directly contributes to process savings because the long catalyst lifetime and appropriate stability.

The performance of TBD compared to the performance of SrO increases when these catalysts are mixed in the following ratio $\text{TBD}:\text{SrO} = 30:70$. The catalytic activity of the TBD is increased by mixing it with animal shells during the first minutes of the reaction. The mixing ratios were: $\text{TBD}:\text{egg shell} = 70:30$ and $\text{TBD}:\text{lobster shell} = 70:30$. The catalytic activity of SrO is increased by mixing it with the lobster shell in a proportion $\text{SrO}:\text{lobster shell}$ of 70:30. Egg seems to increase the catalytic activity of the TBD in a significant way.