CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

X-ray fluorescence results indicate that every catalyst still has a metal leaching problem. And BET surface analysis results show that loading of metal can block up the pore of SBA-15. For the activity, the investigated catalysts (CaO/SBA-15, BaO/SBA-15, CaO/Al_2O_3, BaO/Al_2O_3, SILD CaO/Al_2O_3, and SILD BaO/Al_2O_3) show similar activities for the etherification of glycerol at 250 °C with 2 wt% loading of each types of catalyst. The final conversion of CaO/SBA-15, BaO/SBA-15, CaO/Al_2O_3, BaO/Al_2O_3, SILD CaO/Al_2O_3, and SILD BaO/Al_2O_3 are 12.9%, 13.5%, 12.7%, 13.3%, 14.0%, and 14.2%, respectively. The activity of the catalysts does not depend upon only its surface area. SILD method seems to be the promising preparation technique. SILD catalysts can show the higher glycerol conversion with the less percentage of metal loading when compared to impregnated catalysts. Diglycerol selectivity of 100% is achieved only at low glycerol conversion up to around 6-7% and the selectivity declines with higher glycerol conversion. The different pore diameter of both SILD and impregnated catalysts might have some effects on Etherification of glycerol but only when metal leaching problem does not occur.

5.2 Recommendations

For further development of this research, I do recommend that SILD on SBA-15 should be prepared in order to confirm that there is no effect of different pore diameter and catalyst prepartion technique in etherification of glycerol. Moreover, this research could analyze the diglycerol oligomers e.g. linear, cyclic and branch diglycerol. The recover and reuse of the catalysts should be further studied.