CHAPTER V
CONCLUSIONS AND RECOMMENDATION

5.1 Conclusions

All of the investigated solid catalysts (NaOH, KOH, $Ca(OH)_2$, MgO, CaO, and ZrO_2) have shown their potential to be used as the catalyst for the polymerization of glycerol. Base on the preliminary experiments, it was showed that the most efficient homogeneous catalyst for glycerol dimerization was NaOH while heterogeneous catalyst was CaO. Thus, NaOH and CaO were selected for further study with the amount of catalyst, reaction temperature, and reaction time. At the same mole of catalysts loading, NaOH exhibited glycerol conversion higher than CaO while CaO provided diglycerol selectivity higher than NaOH. In the case of reaction temperature, CaO requires higher temperature than NaOH in order to get the same conversion. However, the optimum temperature for NaOH and CaO catalysts for glycerol dimerization was at approximately 250 °C. For the reaction time, CaO needed longer reaction time than NaOH for the same conversion. The optimum reaction time for CaO is 6 hours while it is 4 hours for NaOH. From these results, it can be summarized that NaOH is more reactive than CaO for glycerol dimerization, but CaO has better diglycerol selectivity than NaOH.

5.2 Recommendation

From this work, the use of solid catalysts in the polymerization of glycerol is demonstrated. The selective synthesis of diglycerol could be done over solid oxide catalyst. It is recommended that, with the help of shape selectivity, other mesoporous solid oxide with uniform structure should be tested for the high selectivity of diglycerol from condensation of glycerol.