CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In the present study, the sol-gel Cu-ZnO/Al_2O_3 catalyst has been developed for glycerol dehydroxylation to propylene glycol. The optimum conditions to synthesize the sol-gel Cu-ZnO/Al_2O_3 catalyst for this reaction are an AIP-to-water molar ratio of 1:150, solution pH of 10, and calcination temperature of 500 °C. This catalyst was taken to further study the effect of catalyst preparation on the catalytic activity of glycerol dehydroxylation to propylene glycol. The Cu-ZnO/Al_2O_3 catalyst prepared by incipient wetness impregnation exhibits the highest catalyst performance compare to the catalyst prepared by co-precipitation and sol-gel methods. This is because of the lower coke formation over the impregnated Cu-ZnO/Al_2O_3 catalyst. In addition, causes of the catalyst deactivation are found to be the combination of deposited carbon and sintering of active metals. Therefore, the catalytic activity of the Cu-ZnO/Al_2O_3 catalysts cannot be fully recovered by a simple coke removal.

5.2 Recommendations

In this work, it is possible that some residual carbon also stay in the catalyst pores in the part of catalyst regeneration. Therefore, slower heating rate in the regeneration step for entire coke removal should be investigated in the future work. Moreover, quaternary catalyst with Mn promoter is an interesting idea as shown in the work of Tan *et al.* (2005). The Mn-modified Cu-ZnO/Al_2O_3 catalyst could significantly improve the catalyst stability in slurry phase DME synthesis, reduce the sintering of the catalyst and promote the activity together with stability compared to the unmodified catalyst.