

## CHAPTER V

### CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Conclusions

This research work was investigate the diethyl carbonate synthesis from ethanol and supercritical carbon dioxide over the  $Ce_xZr_{1-x}O_2$  mixed oxide catalyst and the results confirmed that 7 %Ce-Zr calcined at 700 °C has a potential to synthesized diethyl carbonate in maximum amount due to the tetragonal phase of  $ZrO_2$  and moderate acidity and basicity over the catalyst.

In operating conditions, the synthesis could be performed in temperature at 140 °C in supercritical condition due to the exothermic reaction with the feed molar ratio at 4:1 DEC amount to reach the highest amount of DEC at the equilibrium at 15 h.

#### 5.2 Recommendations

According to the thermodynamic limitation in the chemical reaction of DEC from EtOH and  $CO_2$  in supercritical condition, suggested that the reaction was not suitable to use  $CO_2$  as a reactant in this reaction. To utilize  $CO_2$  for reducing this greenhouse gas, the author suggested another way which is called biological uses by using agricultural plant to absorb the greenhouse gas.