

## CHAPTER VI

### CONCLUSIONS AND RECOMMENDATIONS

#### Conclusions

The conclusions emerged from this research are as follows:

1. The dispersion of palladium over lanthana-modified silica is higher than unmodified silica.
2. The lanthana-modified silica can reduce the ethanol dehydration reaction.
3. The palladium catalysts supported on lanthana-modified silica are more active and selective than the unmodified catalysts in the temperature range 200-300°C due to an increase of the palladium metal dispersion on lanthana-modified silica. Ethanol dehydration, which is a side reaction, does not take place in these conditions.
4. At the temperature range 400-500°C, lanthana-modified supported catalysts exhibit lower activity and selectivity than those of the unmodified ones. The good Pd metal dispersion promoted by lanthana does not only enhance the catalytic performance for the ethanol decomposition but also increase the sites responsible for the ethanol dehydration that induce carbonaceous deposits.

#### Recommendations

The following subjects are recommended for future study:

1. To confirm the catalyst stability, longer operation should be performed.
2. In order to decrease the acidity of supported silica, which can reduce the dehydration of ethanol to ethylene, the study of the other promoters like, CeO<sub>2</sub> and MgO should be investigated.

3. The dispersion of Pd over catalyst is main function to ethanol decomposition. The interaction between Pd and  $\text{La}_2\text{O}_3$  prepared by using different Pd Precursors should be further studied.