

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This thesis studied the catalytic activity of Au/TiO₂ catalysts for selective CO oxidation in the presence of excess H₂. The pretreatment, calcination temperature, metal Au loading, and catalyst preparation were found to have a strong effect on the performance of the Au/TiO₂ catalysts. Furthermore, the effects of presence of CO₂ and H₂O, as well as its stability were also investigated. The characterizations by various techniques were done in order to explain the behavior of each catalyst. From the results, it can be concluded that:

1. The catalytic activity strongly depended on the procedure of pretreatment.
 - Au/TiO₂ prepared by deposition-precipitation method (Degussa P-25): (DP1) preferred calcined at 400°C for 5 h followed by O₂ pretreatment.
 - Au/TiO₂ prepared by deposition-precipitation method (Sigma): (DP2) preferred calcined at 400°C for 5 h followed by O₂ pretreatment.
 - Au/TiO₂ prepared by impregnation on sol-gel method (ISG) preferred calcined at 300°C for 5 h followed by H₂ pretreatment.
2. 1%Au/TiO₂ catalyst prepared by DP1 method gave the highest catalytic activity while catalyst prepared by ISG method showed the best activity with 0.5%Au loading.
3. The activity of the catalysts was found to be dependent on the preparation method; in particular, catalyst prepared by DP1 with adding Mg citrate as promoter had the best performance. The results indicated that catalyst prepared by DP1 gave better activity than DP2 and ISG methods. Moreover, the higher BET surface area and smaller particle size of Au, as well as a strong contact interaction between Au particles and TiO₂ support are important for improving the catalytic activity.
4. Adding CO₂ in the reactant feed, generally, caused a decrease in catalytic performance. While the presence of H₂O in the reactant gas enhanced the

performance of catalyst. It was interesting that H₂O did not deactivate the catalyst but enhanced the catalytic reaction.

5. The result of the deactivation test indicated that the catalyst also exhibited good stability.

5.2 Recommendations

It is recommended that the preparation method and type of support effect on the catalytic performance. The use of Mg citrate as the promoter should be investigated in more detail for improving the catalytic performance.