

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This research investigated the catalytic activity of the Pd/CeO₂-ZrO₂ catalysts for selective CO oxidation in the presence of hydrogen. The experimental results achieved indicated that the pretreatment procedure, Pd loading, calcination temperature, Ce and Zr loading, type of support, and catalyst preparation had strong effect on catalyst activity. The surface area of Pd/CeO₂-ZrO₂ was higher than Pd over single oxide sample. The impregnation on sol-gel catalyst presented higher crystallinity than co-precipitation catalyst in XRD pattern. The catalysts prepared by co-precipitation method had higher activity than catalysts prepared by impregnation using sol-gel method supports. The 1%Pd/CeO₂ co-precipitation catalyst which was calcined at 300°C for 2 hours exhibited the highest activity. Reducing these catalysts by 10% H₂ at 300°C for 3 hours increased their activity even further.

The CO selectivity of all the catalysts were rather poor (approximately 30%) indicating that Pd is inferior to Pt for selective CO oxidation.

5.2 Recommendations

The catalyst preparation technique greatly affected the activity of Pd/CeO₂-ZrO₂ catalyst. Supports with small CeO₂ crystallites exhibited the highest activities. Since our sol-gel supports had much higher crystallinity due to the higher calcination temperatures a potential way of reducing the crystallite sizes of the sol gel catalysts would be to lower the calcination temperature and study the dependence of activity on the calcination temperature. Furthermore studies along the ceria-zirconia solubility boundary

would also be helpful in that close to the phase separation it may be possible to get mixed crystallites with small diameters.