CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This research was to investigate the catalytic activity of the $Ce_{1-x}Zr_xO_2$ mixed oxide catalysts (x = 0, 0.25, 0.50, 0.75, 1.0) for low temperature CO oxidation. The $Ce_{1-x}Zr_xO_2$ mixed oxide catalysts had higher BET surface areas than the conventional methods, such as impregnation and co-precipitation. The addition of zirconia can increase the thermal stability of ceria. Even though the mixed oxide catalysts were calcined at high temperature (900°C), their surface areas were still higher compared to those of the catalysts prepared by the conventional techniques. The presence of CeO_2-ZrO_2 solid solutions were observed, especially in $Ce_{0.75}Zr_{0.25}O_2$ samples. The addition of zirconium into the lattice of ceria strongly promotes bulk reduction at low temperatures and it was shown that, among CeO_2-ZrO_2 solid solutions, the catalyst containing 75 mol % of cerium gave the lowest reduction temperature. The samples that contained larger amount of the solid solutions had higher conversion of CO because of their easier reducible oxygen atoms, which caused from the distortion of the structures of solid solutions.

5.2 Recommendations

In order to eliminate the sintering and deactivation of the TWC catalysts totally, new preparation methods should be studied. Recently, there are many studies about the catalysts that have higher OSC. The mixed oxide catalysts were interested; especially the CeO_2-ZrO_2 mixed oxides. The insertion of trivalent cation, such as Y^{3+}, Ga^{3+} or La^{3+} (x' = 0.01-0.10), into the

lattice of CeO_2-ZrO_2 solid solution to form $Ce_{0.6}Zr_{0.4-x}M_xO_{2-x/2}$ were investigated by Vidmar *et al.* in 1997. Interestingly, this can improves the OSC at low temperatures compared to the undoped sample. The appropriate type of dopant and its concentration should be investigated.