

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Two catalysts (Au/MnO_x and Au/FeO_x) were prepared and tested for their catalytic activity for selective oxidation of CO in the presence of H₂. It was found that pretreatment conditions, calcination temperature, Au loading, and type of support strongly affected the catalytic activity. Au/MnO_x achieved 93% conversion and 58% selectivity at 130°C with He pretreatment, calcination temperature of 300°C, and gold to base metal atomic ratio of 1/30. For the Au/FeO_x, the corresponding numbers were 98% conversion and 53% selectivity at 50°C with O₂ pretreatment, calcination temperature of 400°C, and gold to base metal atomic ratio of 1/30. Au crystallite size as well as support morphology played an important role in the catalytic activity. The presence of Au crystallites with sizes ranging from 3-10 nm was found to be necessary for high catalytic activity. The presence of CO₂ in the reactant feed decreased the catalytic activity. Both catalysts were affected only minimally by the presence of H₂O up to the concentration of 10%. Au/MnO_x and Au/FeO_x not only have superior activity but also operating temperatures convenient for use in a fuel processor. Furthermore, these two catalysts exhibited excellent stability in activity and selectivity for 48 h with no observable change.

5.2 Recommendations

The presence of Mg citrate in the preparation solution was found to be potentially beneficial to the catalytic activity by lowering Au crystallite size (Bethke and Kung, 2000). Although, the catalytic activity of these two catalysts was superior to the conventional catalyst, further study is still necessary in order to optimize the catalyst having 100% conversion to absolutely produce the H₂ stream containing less than 10 ppm CO.

The catalyst preparation method also strongly affected the catalyst activity. Coprecipitation method, which was used in this research work, is not the only way to obtain the good catalyst. Sol-gel method has been found to be potential for the high catalytic activity catalyst. Working on this kind of preparation method is also promising.