CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The catalytic performance for preferential CO oxidation in the presence of H_2 over Au, Pt and Au-Pt supported on mordenite catalysts prepared by deposition precipitation had been studied in this work. The effects of Au:Pt ratio, catalyst pretreatment and calcination on the catalytic performance were investigated. The best catalyst was also compared between simulated reformate gas and studied reformate gas from fuel processor system, starting from natural gas. Based on all results, the conclusions can be summarized as follows:

TEM and H_2 pulse chemisorption investigation indicated that nano Pt particles were deposited on the mordenite zeolite. Using deposition of Au and Pt, It could be able to obtain Au-Pt single particle did not segregate of Au or Pt.

The catalytic activities of all catalysts depended on the metal crystallite size and the metal loading. Additionally, BET surface area results indicated that the catalytic activities depended on the surface area of the prepared catalyst.

A small amount of Pt was added to the Au/mordenite zeolite catalyst, the CO conversion was improved and the selectivity was increased at high temperatures. However, the monometallic Pt/mordenite catalyst was more active than the bimetallic catalysts (AuPt/mordenite). It was found that the CO conversion were in the order of 1% Pt/MOR > 1% (1:5) Au:Pt/MOR > 1% (1:1) Au:Pt/MOR > 1% Au/MOR.

1% Pt supported on mordenite zeolite with H_2 pretreatment gave the best performance and the temperature at the maximum CO conversion was shifted to 170°C. However, 1% Pt/MOR with non-pretreatment and He pretreatment gave wider range of temperature at the maximum CO conversion.

The calcination led to decrease the surface area of prepared catalyst because the metal form aggregation and obstruct the small pore of zeolite. Thus, the calcined catalysts showed lower catalytic activities than the uncalcined catalysts.

The 1% Pt/mordenite zeolite was applied for PROX unit in fuel processor system for a H_2 production utilizing natural gas as the H_2 feedstock. The gas stream

products gave the H_2 concentration of 57.09% and the CO concentration remained at 334 ppm during the testing period. However, the 1% Pt/mordenite in fuel processor could not achieve 100% conversion because of the effects of CO, H_2O, and other gases in gas stream. The fuel processor can be used to produce H_2 about 90 liters/day.

5.2 Recommendations

The reformate stream for the steam reforming unit and water gas shift unit contains some amounts of CO_2 and H_2O; therefore, further study is necessary in order to test this catalyst in the presence of CO_2 and H_2O. Zeolite was used as a catalyst support because it is a high porous material and has a good thermal stability. Additionally, zeolite would be a good candidate to prepare the small metallic or bimetallic particles, because their supercages or channels lead to a good dispersion in well defined positions. Thus, the effects of the pore openings and pore shapes of zeolite on the activity of supported nano metal are also recommended to be examined.