CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Appropriate amounts of ruthenium and gold in the bimetallic ruthenium-gold catalysts supported on high surface area silica had the effects on their characteristics. The results obtained from TPR profiles, BET surface areas, SEM micrographs, and XRD patterns revealed the interaction between ruthenium and gold. The active species formed from these two metals were clearly seen in RS091 (3.32 %wt Ru and 0.61 %wt Au on SiO_2). The addition of gold in ruthenium catalysts may result in the creation of different types of adsorption sites which were so active for methanol oxidation. From the TPD results, it affected only on the desorption of methanol and modified the mechanism of methanol decomposition. Therefore, the methanol reaction rate was high on bimetallic catalysts and the activation energy was the lowest value on RS091. The XRD results show that after reaction, ruthenium was oxidized to ruthenium oxide in both monometallic ruthenium and bimetallic ruthenium-gold catalysts. Moreover, species derived from the interaction between ruthenium and gold was still so active after methanol oxidation. The support material also had the effects on both characteristics and reaction rate of the catalysts. Although, the bimetallic clusters did not form on the alumina support, the methanol conversion observed on these catalysts was still so high. It is because methanol was oxidized to various intermediate products apart from carbon dioxide.

5.2 Recommendations

The TPD study should add a mass spectrometer as an additional tool to identify the exact nature of the species desorbed from these catalyst samples. Moreover, the TPD should be done on other oxygenated compounds such as acetone and aldehyde to get better understanding of the interaction of oxygenated compounds on these catalysts. For methanol oxidation study, the other variables such as space velocity and the methanol concentration should be varied and then, the rate raw equation can be established. In addition, the oxidation kinetics of methanol should be carried out to find the effect of gold and support in bimetallic ruthenium catalysts to the rate raw equation.