

CHAPTER VI

CONCLUSIONS AND RECOMMENDATION

This chapter is focused upon the conclusions of the experimental details of cobalt (Co) catalysts dispersed on various mixed nano-SiO₂-ZrO₂ supports for carbon monoxide (CO) hydrogenation reaction, and compared with those on the traditional mixed micron-SiO₂-ZrO₂ supports which were described in section 6.1. In addition, Recommendations for further study are given in section 6.2.

6.1 Conclusions

6.1.1 Various nanoscale mixed SiO₂/ZrO₂ supports

The present study revealed the characteristics of cobalt dispersed on various mixed nano-SiO₂-ZrO₂ supports. It indicated that Co oxide species were in the highly dispersed form as nano-sized particles on the various supports. There was no significant change in morphologies and elemental distributions of samples as seen from SEM/EDX. The presence of ZrO₂ in the mixed supports could result in the larger number of active Co metal atoms as detected using H₂ chemisorption due to the less support interaction. This resulted in higher activity of the sample. However, the chain growth probability was found to slightly increase with the presence of the nano-ZrO₂ in the mixed nano-SiO₂-ZrO₂ support.

6.1.2 various micron- and nanoscale mixed SiO₂-ZrO₂ supports.

Based on the present study, it can be concluded as follows:

1. The size of Co oxide species dispersed on a support was corresponding to the size of the support used.
2. Besides the support interaction and particle size, the nature of supports used was also the key to determine the number of active sites present.

3. For the SiO_2 support, the catalyst dispersed on micronscale SiO_2 was more active due to the strong interaction between SiO_2 and the catalyst. Hence, the larger particle can be reduced more easily.
4. For the ZrO_2 support, the catalyst dispersed on the nanoscale ZrO_2 was more active due to the weak interaction between ZrO_2 and the catalyst. Hence, the smaller particle can be reduced more easily.
5. Use of mixed SiO_2 - ZrO_2 supports apparently resulted in similar properties with the sole SiO_2 support due to the fact that the interaction of SiO_2 with Co oxides species was predominant.

6.2 Recommendations

1. In order investigation on different interactions, the amounts of Co loading should be varied to use in the nano-and micron scale SiO_2 - ZrO_2 supports.
2. Besides Co metal, other metals such as Ni, Pd, Fe and etc should be further investigated with the nano-and micron scale SiO_2 - ZrO_2 supports.