CHAPTER V
CONCLUSIONS

Au/CeO_2 catalysts prepared by DP method were investigated for the LT-WGS. Initial activities of Au/CeO_2 were much lower than those of a commercial $CuO/ZnO/Al_2O_3$ catalyst. The commercial catalyst both Shiftmax 120 (for HT-WGS) and Shiftmax 230 (for LT-WGS) was used as a benchmark. The CeO_2-Ls was used first as a support in the first three studied effects. Later on, the CeO_2-HS exhibited better activity than CeO_2-LS thus the left of experiment was performed by using CeO_2-HS as a support.

Space velocity strongly affects to the prepared Au/CeO_2 catalysts on LT-WGS activity. At lower space velocity, the more contact time was increased, the better LT-WGS activity was observed. This is, however, still less steady than the commercial $CuO/ZnO/Al_2O_3$ catalyst which can be tolerated at a higher space velocity.

Amount of gold loading on the CeO_2 can enhance the LT-WGS activity. But the 2% and 5% Au/CeO_2 sample manifested comparable activity in LT-WGS reaction which is higher than those of the 1% Au/CeO_2 sample. Another important factor is the well-dispersed of the gold nanoparticles. The gold particle distribution from TEM analysis showed many large gold particles from 5% Au/CeO_2 sample. The good technique and well experience are required in order to synthesize well-dispersed gold on the support.

H_2 pretreated on 2%Au/CeO_2 slightly increases the LT-WGS reaction. This is due to the occurrence of more metallic gold (Au^0) which found to be more active than cationic gold ($Au^{\delta+}$) species which bind CO more strongly than Au^0.

Type of CeO_2 evidently affects to the dispersion of gold leading to the LT-WGS activity. Almost ten times of specific area from HS-sample facilitated the well dispersion of gold nanoparticles. As proved by the particle distribution from TEM analysis, the major of gold nanoparticles was 1-15 nm for HS-sample while LS-sample was 6-20 nm with few particles bigger than 25 nm.

Amount of H_2O and H_2 in the reactant affects to the equilibrium of WGSR. The WGS reaction pushed more forward when the amount of water was increased.

On the other hand, the presence of H_2, the product of WGS reaction, backward the WGS reaction or we can say that the reverse WGS was occurred.

The stability of Au/CeO_2 catalyst still not value in continuous LT-WGS reaction. Although the bench-scale experiment presented the better CO conversion of Au/CeO_2 catalyst than in the lab-scale result (in presence of H_2). However, the LTS activity was still lower than that of commercial catalyst. The more understanding in the state-of-art of Au/CeO_2 catalyst preparation was need to improve both more reactivity and stability of prepared Au/CeO_2 catalyst.