CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In the conclusion, the preparation methods, which are co- and sequential impregnations, affect the catalysts properties and methane steam reforming catalytic activity of Mn-promoted on Ni/CZO. The results showed that both preparation methods provided a higher reducibility of NiO with increasing Mn loading. It was indicated that higher amount of Mn provides stronger interaction of metal and support. The alloy of Ni-Mn was not identified ethers by TPR and XRD. The Mn-promoted was mainly enhanced the water gas shift reaction and suppressed carbon deposition of catalysts. The Ni-Mn/CZO catalysts decrease the amount of carbon deposition due to partial coverage of NiO particles with Mn species that disrupting the active site ensembles responsible for coking. Additionally, the multi-step incipient wetness impregnation methods provided a better catalytic activity than those prepared via co-impregnation method under the same condition.

5.2 Recommendations

The oxidation state of Mn is very interesting because the catalytic activity of Mn-content catalysts on methane steam reforming is concerned with Mn species. X-ray photoelectron spectroscopy (XPS) is recommended to characterize the catalysts. The lower temperature such as 500°C should be tested on SMR for verified Mn-promoted could reduce the carbon deposition and enhance the WGS reaction. In addition, the operating parameters such as the S/C ratios as well as the reaction kinetic analysis should also be investigated.