



A comparison study on Cu/CeO₂ catalysts for single stage water gas shift reaction to produce high purity hydrogen

Yong-Hee Lee¹, Min-Ju Park², Dae-Woon Jeong^{1,2,3*}

1 Department of Smart Environmental Energy Engineering, Changwon National University, Republic of Korea

2 Department of Environmental and Chemical Engineering, Eco-friendly offshore plant FEED engineering course, Changwon National University, Republic of Korea

3 School of Civil, Environmental and Chemical Engineering, Changwon National University, Republic of Korea

ABSTRACT

CeO₂ based catalyst has been received considerable attention for WGS activities due to the high Oxygen Storage Capacity (OSC) of ceria, associated with its rich oxygen vacancies, the character of strong interaction with active metal and easily change between Ce³⁺ and Ce⁴⁺. Thus, to design nano sized CeO₂ support is one of the most important issues in CeO₂ supported catalysts for WGS reaction. In this research, we compared to Cu/CeO₂ catalysts that CeO₂ is prepared using different precipitants/digestion method: Cu/CeO₂-CH(Cerium Hydroxy), Cu/CeO₂-CHC(Cerium Hydroxy Carbonate), Cu/CeO₂-CC(Cerium Carbonate). CeO₂ supports have been synthesized through a different precipitation/digestion method with various cerium precursors. 20 wt.% of Cu was loaded onto the prepared CeO₂ supports through an incipient wetness impregnation method. And their physicochemical properties were investigated using N₂O-chemisorption, XPS and TPR. Among the prepared catalysts, Cu/CeO₂-CHC yielded the highest CO conversion between the temperature range from 200 to 360 °C. This result was primarily due to possessing the highest Cu dispersion and a high oxygen storage capacity (OSC). In addition, the 20 wt.% Cu/CeO₂ catalyst exhibited 100% CO₂selectivity.

Keywords: OSC(Oxygen Storage Capacity); Cu dispersion; Cerium hydroxy carbonate; Cerium Carbonate; Precipitant; Digestion time;

Acknowledgements: This work was supported by the Korea Ministry of Environment as

Waste to Energy-Recycling Human Resource Development Project (YL-WE-19-001).