

Study of the influence of the Cu loading on CeO₂/ZrO₂ supported Cu catalysts for Low-Temperature WGS reaction

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In our previous study, we investigated the Ce/Zr ratio in Cu-CeO₂-ZrO₂ catalysts employed in the LTS (Low Temperature Shift) step. A cubic-phase Cu-Ce_{0.8}Zr_{0.2}O₂ catalyst (The loading amount of Cu = 20 wt%) exhibited the highest turnover frequency and lowest activation energy of the catalysts tested, and its CO conversion was maintained for 100 h. In this study, we focused on optimizing the Cu loading in a cubic Ce_{0.8}Zr_{0.2}O₂-supported Cu catalyst to further improve its performance. For this approach, we synthesized a series of catalysts with different Cu loadings in the range of 20 wt% - 90 wt% and evaluated their LTS-reaction performances in the temperature range of 240°C - 320°C. As a result, the 80 wt% Cu-Ce_{0.8}Zr_{0.2}O₂ catalyst exhibits the highest CO conversion in the temperature range from 200°C to 400°C at a GHSV of 150,494 h⁻¹. In addition, it exhibits stable activity at 240°C for 100 h. The excellent catalytic performance of this catalyst is primarily because of the high abundance of surface Cu atoms and the low activation energy.