



The effect of preparation method on Ni/Ce/Al catalyst for high temperature water-gas shift reaction

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High temperature water-gas shift reaction (HT-WGSR) is used for hydrogen production and lower CO content in H₂/CO ratio for syngas production. This process is normally operated after reforming process. Our work reports physicochemical properties and the HT-WGSR performance of Ni/CeO₂-Al₂O₃ catalysts which have a composition similar to the catalyst for reforming process. Ni/CeO₂-Al₂O₃ catalysts were prepared by 1 step and 2 step method. For 1 step method, Ni/CeO₂-Al₂O₃ catalysts were synthesized by sol-gel method. During 2 step method, CeO₂-Al₂O₃ support was synthesized by sol-gel method followed by the impregnation of Ni salt solution. The catalyst samples were characterized by XRD, BET, H₂-TPR and H₂-TPD techniques. The catalytic performance of all catalysts on HT-WGSR was carried out at 550°C, steam to CO ratio of 3 and GHSV of 2×10⁵ mLh⁻¹gcat⁻¹. The results reveal that the catalyst prepared by 2 step method shows four types of reduced able active sites and the catalyst prepared by 1 step method has two types of reduced able active sites. The catalyst prepared by 2 step method also provides higher metal dispersion and larger metal surface area than those of the catalyst prepared by 1 step method. Thus, the catalyst prepared by 2 step method (%X_{CO} = 68.7) provides higher CO conversion than the catalyst prepared by 1 step method (%X_{CO} = 60.0).

Keywords: Ni/CeO₂-Al₂O₃, catalyst preparation, high temperature water-gas shift reaction