Hydrogen production using Niobium-doped Co-CeO_2 catalyst

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ABSTRACT

Recently, cobalt-based catalysts are attracting attention due to their high activity in HTS reactions. However, due to its low stability, research is needed on promoters that can improve the stability of the catalyst. In this study, a niobium-doped Co-CeO_2-Nb_2O_5 catalyst was prepared by co-precipitation to increase the activity and stability of the Co-CeO_2 catalyst for high temperature shift reaction. And their physicochemical properties were investigated using N_2 adsorption/desorption, XPS, XRD, and H_2-CO_2 pulse measurements. The results obtained revealed that the Co-CeO_2-1.5Nb_2O_5 catalyst showed the highest catalytic performance among the Co-CeO_2-Nb_2O_5 catalysts at an extremely high gas hourly space velocity of 637,320 h^{-1}. In addition, this catalyst showed an excellent performance that remained stable for 50 h. This high activity and stability of the Co-CeO_2-1.5Nb_2O_5 catalyst resulted from its high oxygen storage capacity (OSC), Co dispersion, and small CoO size. Therefore, it is a promising catalyst for hydrogen production via the high temperature shift reaction.

Keywords: Cobalt-based catalysts; High temperature shift; Hydrogen; Niobium; Oxygen storage capacity;

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