Ceria Supported Cu-Co Composite Catalyst for WGS Reaction

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Water-gas shift (WGS) reaction produces hydrogen from carbon monoxide in the petrochemical process. While WGS reaction has an advantage that it could produce additional hydrogen from wasted substances, if the sub reaction occurs, hydrogen production decreases, and the methane formed could cause pollution. Platinum, the most widely used catalyst for WGS reactions, is highly efficient but costly too. To solve this problem, inexpensive transition metals were used to manufacture catalysts. While catalysts are usually composed of a single metal, this research developed a catalyst with the combination of two metals, Cu and Co, and to enhance its reusability, CeO2 was implemented as a supporter. The catalyst was synthesized by wet impregnation method and the physical structure of the catalyst, KIT-6 mesoporous silica structure, which has a vast surface area of 100m2/g was applied. In order to find the best chemical composition, the ratio of Cu and Co and the amount of CeO2 loading was varied. Catalysts were examined by their activity, selectivity, and reusability, through CO conversion rate, CH4 yield, and XRD data. The most efficient catalytic aspects were achieved from 30wt% Cu0.15Co2.84O4/CeO2 catalyst, with a 100% CO conversion rate and a CH4 yield nearly 0 in 300oC. The catalyst was also secured durability being reusable for at least three cycles. These achievements are probably due to the strong metal-support, and well dispersed metal oxides in the mesoporous surface.