

A study on the effect of alkali and alkaline earth metal promoter on Co/CeO₂ catalyst for the high temperature water-gas shift reaction using waste derived synthesis gas

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The alkali (Na and K) and alkaline earth metal (Ca and Ba) promoted Co/CeO₂ catalysts were prepared and tested for the high temperature water-gas shift (HT-WGS) reaction using waste derived synthesis gas. Interestingly, alkali metal promoted catalysts deactivated rapidly compared to alkaline earth metal promoted catalysts. Alkaline earth metal promoted catalysts showed relatively higher stability (> 50 h) even at a very high gas hourly space velocity of 143,000 h⁻¹. X-ray diffraction (XRD) and transmission electron microscopy (TEM) results reveal that the higher stability of the alkaline earth metal promoted catalysts was due to the strong resistance to sintering, showing a relatively small crystallite size of metallic cobalt compared to the alkali metal promoted catalysts after WGS reaction.