

Performance of Copper-Ceria catalysts for water gas shift reaction in medium temperature range

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A series of Cu-ceria catalysts with Cu content in the range of 20–90 at% Cu were prepared via coprecipitation, and their performance was tested for WGS reaction in medium temperature range (150–360 °C). After the first run, the catalysts stabilized in terms of activity and BET area. The WGS activity of catalysts increased with Cu loading and 80 at% Cu-ceria showed the best performance. BET area alone is not an important property for explaining WGS activity, since the 80 at% catalyst showed a lower BET area than that of lower Cu loading catalysts. XRD results of the fresh catalysts showed highly dispersed copper species at low Cu loadings, but at high Cu loadings Cu was present in both dispersed and bulk like CuO. Formation of metallic Cu species during WGS reaction was confirmed by XRD results of used catalysts. H₂-TPR showed that the reduction started slightly early with increasing Cu loading of up to 80 at%, and the temperatures of the peak maximum were significantly lower than that of pure CuO, indicating a synergy of Cu and ceria. The catalysts showed stable activities at 360 °C and significant deactivation was observed at elevated temperatures above 400 °C.