A Study on Reverse-Water-Gas-Shift Reaction on ZnO Based Catalysts

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Reverse-Water-Gas-Shift Reaction (RWGSR) was carried out over the ZnO/Al_2O_3 catalysts at the temperature range from 600℃ to 800℃. The ZnO showed good specific reaction activity but this catalyst was deactivated. All the catalysts except the ZnO/Al_2O_3 catalyst (850℃) showed low stability for the RWGSR and was deactivated at the reaction temperature of 600℃. The ZnO/Al_2O_3 catalyst calcined at 850℃ was stable during 210 hrs under the reaction conditions of 600℃ and 150,000 GHSV, showing CO selectivity of 100% even at the pressure of 5 atm. The high stability of the ZnO/Al_2O_3 catalyst (850℃) was attributed to the prevention of ZnO reduction by the formation of $ZnAl_2O_4$ spinel structure. The spinel structure of $ZnAl_2O_4$ phase in the ZnO/Al_2O_3 catalyst calcined at 850℃ was confirmed by XRD and electron diffraction.