Effect of doped support and urea on catalytic activity and coke prevention from Ni catalyst for ethanol steam reforming reaction

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Abstract: Active Nickel based catalyst over various supports for ethanol steam reforming (ESR) at low temperature were developed and investigated in the catalytic activity and coke prevention. The supports in this study are γ-Al₂O₃, CeO₂ and Gd₂O₃ doped CeO₂ (Gd₂O₃-CeO₂). Urea was added into Ni salt aqueous solution to increase the homogeneity of Ni in the impregnated solution. The ESR reaction was conducted in a quartz tubular reactor, at 550°C-750°C in continuous mode. The hydrogen production from these catalysts were quantified by gas chromatography (GC), the Ni active surface area was analyzed by the chemisorption analyzer and the catalysts were characterized by the CHN analyzer to identify the amount of coke before and after the reaction. The result shows that the doping of Gd₂O₃ in CeO₂ can reduce the coke formation, and the addition of urea can increase the Ni dispersion on catalyst support, which can improve the catalytic activity of ESR. Ni/Gd₂O₃-CeO₂ with addition of urea, exhibits the highest hydrogen yield with the lowest coke formation. The role of doped support and urea in the catalyst will be discussed.

Keywords: H₂ production; ESR; Doped support; Urea; Coke prevention

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