Butane Steam Reforming on $Ag/Ni/MgAl_2O_4$ Catalysts

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The intensively coke deposition and reforming at high temperature in the conventional $Ni/\gamma-Al_2O_3$ catalyst, which resulted in rapidly catalytic deactivation and reducing H_2 production from hydrocarbon steam-reforming reaction under solid oxide fuel cell (SOFC) operating conditions. Steam reforming reactions of butane over bimetallic Ag/Ni or Ni/Ag of same amount loaded $MgAl_2O_4$ catalysts synthesized by an impregnation approach were studied in this study to improve the mentioned upon. The Ag loaded catalyst on the external surface provided significantly higher reforming reactivity compared to the conventional $Ni/MgAl_2O_4$. The main products from steam reforming over $Ni/MgAl_2O_4$ catalyst without Ag component were H2, CO, CO_2, and CH_4 with a small amount of C_2~. However, the addition of Ag was found to reduce the degree of carbon deposition and improve H2 product selectivity by completely eliminating C_2~ formation regardless of below 750°C. The catalytic performances were different according to the impregnating order of added metal precursors in each step: the H_2 production maximally reached to 0.23mol over $Ag/Ni/MgAl_2O_4$ at 800°C, and however it decreased to 0.13mol at 600°C over $Ni/Ag/MgAl_2O_4$.