

CeO₂-SiO₂ supported nickel catalysts for dry reforming of methane toward syngas production

Abstract

Supported nickel catalysts (5 wt.% Ni) on binary CeO₂-SiO₂ (CS) with different ceria loading were prepared by wet impregnation and evaluated under catalytic dry reforming of methane (DRM) reaction to produce syngas. Analytical methods of characterization i.e. EDX, BET surface area, XRD, H₂-TPR, CO₂-TPD, TEM, SEM and TGA were conducted to analyze the physico-chemical properties of the prepared samples as well as to identify the carbon formation of the spent catalysts. The results showed that the properties of CeO₂-SiO₂ (Ni/xCS) catalysts were superior to the Ni/SiO₂ and Ni/CeO₂ catalysts, in terms of particle sizes, Ni dispersion, reducibility and basicity. The catalyst evaluation showed that ceria addition on the Ni-supported catalysts influenced the catalytic performances and hindered the carbon formation significantly. In this study, Ni/CS catalyst with 9 wt.% ceria exhibited good properties, high catalytic performance, elevated stability and low carbon deposition, thus considered to be the best catalyst with the optimal amount of ceria

Keyword: Dry reforming; Syngas; Nickel catalyst; Ceria; Carbon formation.