SYNGAS PRODUCTION VIA CO2 REFORMING OF CH4 OVER Zr-Ni/SBA-15

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Abstract:
In the present study, the effect of Zirconium (Zr) loading (1-7wt %) as promoter on the properties of Ni/SBA-15 catalyst for production of syngas by CO2 reforming of CH4 were studied. Zirconium promoted Ni/SBA-15 catalyst was prepared using one pot sol-gel method as described in the literature [1]. The physiochemical properties of Zr-Ni/SBA-15 catalysts were characterized using XRD, BET and FTIR meanwhile the catalytic performances of the of the catalyst was carried out in a stainless steel fixed bed reactor at 800°C, atmospheric pressure and CO2/CH4 feed ratio of 1/1. The ordered mesoporous structure of SBA-15 was proven by N2 adsorption desorption isotherms. The surface area and pore volume of catalyst were decreased with the increase of Zr loading as ZrO2 particles were occupied in SBA-15 frameworks and thus destroyed SBA-15 structured [2]. ZrO2 peak of 1Zr-Ni/SBA-15 was not detected in XRD result (Fig. 1) indicates to well dispersion of the Zr species on the SBA-15 surfaces [3]. The catalytic activity test revealed that the optimum Zr loading was at 1 wt% with CH4 conversion, CO2 conversion and H2/CO ratio were 87.07%, 74.01%, and 0.42, respectively as illustrated in Fig. 2. This was due to the well dispersion of Zr that promote the Nickel (Ni) species to confine in the SBA-15 pores as proven by XRD and FTIR analysis. All catalysts showed a good stability up 900oC with less than 5 % weight loss as analyzed by TGA. The addition of 1wt % of Zr enhance the Ni dispersion which create a proper active site for CH4 and CO2 accessibility and also reduce carbon formation.

Keywords: Dry reforming; Zr promoter; Sol gel; Syngas

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