Syngas production from carbon dioxide reforming of methane using coke oven gas on Ni-MgO-Al_2O_3 catalysts: Optimization of preparation method and co-precipitation pH

박호룡, 김범준, 노현석†
연세대학교
(hsroh@yonsei.ac.kr†)

In this study, customized Ni-MgO-Al_2O_3 catalyst for the dry reforming using coke oven gas was developed by selecting a catalyst. To optimize the catalyst, an appropriate catalyst preparation method was selected. Catalysts were prepared by various methods. Among them, the co-precipitated catalyst showed the best CDR reaction performance. To investigate the effect of co-precipitated pH on physicochemical properties and catalytic performance of a Ni-MgO-Al_2O_3 catalyst, the co-precipitated pH is systemically changed. The co-precipitated Ni-MgO-Al_2O_3 (co-precipitated pH=12.0) catalysts exhibited the best performance for CDR reaction. The catalysts were characterized using XRD, BET, H_2-TPR, H_2-chem., and TGA. The interaction between a complex NiO species and the support material showed a strong relationship with the number of Ni° active sites, which also has a direct connection with the activity of the catalyst. Moreover, the catalytic activity was maintained over 50 h and thermodynamic equilibrium was achieved, even at a high gas hourly space velocity of 600,000 h^{-1}.