Effects of carbon formation to catalytic performance for CO2 reforming with methane: Comparison of fixed-bed with fluidized-bed reactor

배종욱*, 김아롱, 한귀영, 한영규
성균관대학교
(finejw@skku.edu*)

The different amounts of filamentous carbon deposition and molar ratio of H2/CO during carbon dioxide dry reforming with methane (CDR) were observed on Ni/Al2O3 catalysts in a lab-scale fixed-bed and a bench-scale fluidized-bed reactor. The differences in conversions of CH4 and CO2, and the molar ratio of H2/CO in a fixed-bed and fluidized-bed reactor are attributed to the different reaction rates of reverse water-gas shift (RWGS) reaction, Boudouard reaction and gasification of deposited carbon precursors. Based on the results, the suppressed filamentous carbon formation in a fluidized-bed reactor is attributed to the fluidization of catalyst particles with a suitable reducibility in a reducing region and a low coke formation on catalyst surfaces by facile gasification of carbon precursors. The different rates of gasification of deposited carbon precursors with water generated by RWGS and Boudouard reaction for coke deposition also alter H2/CO ratio. The behaviors of coke formation were mainly explained by using TGA and Raman spectroscopy.