Comparative Study of Ni Loading Methods Towards Superior CO2 Conversion Over Ni/SBA-15

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Abstract: A series of Ni/SBA-15 catalysts were successfully synthesized via conventional wet impregnation method (C-IM), P123-assisted impregnation method (P123-IM) and ultrasonic-assisted impregnation technique (US-IM) methods. The obtained results confirmed that the impregnation methods significantly influenced the physio-chemical properties of Ni/SBA-15 catalysts, which subsequently influenced the catalytic performances of catalysts. The catalytic performance of catalysts followed the order of Ni/SBA-15(P123-IM) > Ni/SBA-15(US-IM) > Ni/SBA-15(C-IM), indicating the superior performance of Ni/SBA-15(P123-IM) towards CO_2 methanation (CO_2 conv.: 91.1 % , CH_4 selec.: 97.7 %) and CO_2 dry reforming (CO_2 conv.: 82.6 % , H_2/CO: 1.23). An excellent catalytic performance of Ni/SBA-15(P123-IM) owing to its favorable textural properties; homogenous Ni dispersion, smaller NiO crystallite size (12.1 nm), and higher concentration of metal-support interaction. P123-IM method successfully synthesized favorable Ni/SBA-15 for superior CO_2 conversion.

Keywords: Ni/SBA-15, impregnation, CO_2 conversion, dry reforming, methanation.