Effect of CeO_2 and $Ce-ZrO_2$ promoters on Ni/Mg(Al)O catalyst for mixed steam and carbon dioxide reforming of methane

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The promotional effect of CeO_2 and $Ce-ZrO_2$ on Ni/Mg(Al)O catalyst was examined in mixed steam and carbon dioxide reforming of methane (SCR) to produce synthesis gas. The supported Ni catalysts were prepared by co-impregnation and stepwise impregnation method on hydrotalcite Mg(Al)O. Catalyst characterization was conducted by XRD, H_2-TPR, TPO, H_2-chemisorption, CO_2-TPD, BET, and TEM. $H_2/(2CO+3CO_2)$ ratio of 0.85-1.15 was achieved by changing the feed ratio of $CH_4/H_2O/CO_2$. The promoted catalysts exhibited higher catalytic performance and coke resistance than that of Ni/Mg(Al)O catalyst. The high activity and stability of the CeO_2 and $Ce-ZrO_2$ modified Ni/Mg(Al)O catalyst was closely related to its high Ni metal dispersion, increase of basic strength and facile mobility of oxygen species on the surface of catalyst.