Steam CO_2 reforming of methane over $La_{1-x}Sr_xNiO_3$ perovskite catalysts

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$La_{1-x}Sr_xNiO_3$ perovskite catalysts were prepared by EDTA-cellulose method and characterized by TPR, N_2 phsysorption, TGA, XRD, TEM and SEM. The effect of promoting a perovskite ($LaNiO_3$) catalyst with different amounts of Sr (0.1 - 0.5) to produce syngas via steam CO_2 reforming of methane was investigated. Steam CO_2 reforming of methane over the prepared catalysts carried out in a fixed bed reactor system under 900 °C, 10 bar and GHSV of $3000h^{-1}$. It was found that the 0.1 mole Sr-promoted catalyst had higher conversion and showed higher performance in terms of resisting deactivation by coke formation. It was found that the effect of Sr on activity, selectivity and stability are driven by segregated phases generated by Sr due to the difference of ionic radius between La and Sr. The Sr substituted perovskite had high O_2 mobility which led to higher gasification rates of carbonaceous species, resulting in higher H_2 generation and preventing carbon formation of the catalyst. Time on stream studies showed that $La_{0.9}Sr_{0.1}NiO_3$ is a potential candidate for steam CO_2 reforming of methane to produce syngas.