Performance of Rh-added $La_{0.8}Ce_{0.2}Fe_{0.7}Ni_{0.3}O_3$ perovskite catalysts in the steam reforming of methane

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The performance of Rh-added $La_{0.8}Ce_{0.2}Fe_{0.7}Ni_{0.3}O_3$ (Rh/LCFN) perovskite catalysts, prepared using a Pechini method, in the steam reforming of methane (SRM) was investigated. The prepared catalysts were characterized by N_2-physisorption, X-ray diffraction (XRD), temperature-programmed reduction (TPR) and elemental analysis (EA). The Rh-added catalyst, Rh/LCFN, exhibited a higher activity and produced a larger fraction of H_2 under the reaction conditions of this study, i. e., using a reactant stream containing steam (S) and methane (C) at S/C ratios of 1~3 and at temperatures of 600~800°C, compared with the case of unpromoted LCFN. TPR results indicated that the reducibility of Ni oxide in the catalyst was enhanced by Rh addition because Ni oxide could be easily reduced due to the spillover of hydrogen from the surface of reduced Rh to Ni oxide. The increased reducibility of Ni oxide and coke resistance in the Rh-added catalyst also contributed to suppressed deactivation of the catalyst, as was confirmed by TPR and EA.