

Development of Ni-YSZ Based Tri-reforming Catalyst for the Production of Synthesis Gas

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The tri-reforming of CH_4 over Ni-YSZ based catalysts as CO_2 reduction and sequestration technology was performed to produce a synthesis gas for application in the production of high valued chemicals and a fuel processor of SOFC and MCFC systems. The catalysts were prepared by physical mixing and impregnation methods. The tri-reforming reaction was carried out at a temperature range of 650 to 850 °C and feed molar ratio of $\text{CH}_4 / \text{CO}_2 / \text{H}_2\text{O} / \text{O}_2 = 1 / 1 / 1 / 0.1$ in a fixed bed reactor system. The catalysts before and after the reaction were characterized by N_2 physisorption, XRD, TEM, SEM and Elemental analysis. It was found that the tri-reforming reaction was a more desirable process for the production of synthesis gas than other reforming process. It was also found that Ni-YSZ-CeO₂ catalyst showed higher catalytic activity and stability than commercial Holder Torpsoe and ICI catalysts. The results suggest that Ni-YSZ-CeO₂ catalyst is a promising candidate for the production of synthesis gas from greenhouse gases.