Syngas Production From Glycerol-Dry(CO_2) Reforming Over La-Promoted Ni/Al_2O_3 Catalyst

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ABSTRACT

A 3 wt% La-promoted Ni/Al_2O_3 catalyst was prepared via wet co-impregnation technique and physicochemically-characterized. Lanthanum was responsible for better metal dispersion; hence higher BET specific surface area (96.0 $m^2\ g^{-1}$) as compared to the unpromoted Ni/Al_2O_3 catalyst (85.0 $m^2\ g^{-1}$). In addition, the La-promoted catalyst possessed finer crystallite size (9.1 nm) whilst the unpromoted catalyst measured 12.8 nm. Subsequently, glycerol dry reforming was performed at atmospheric pressure and temperatures ranging from 923 to 1123 K employing CO_2-to-glycerol ratio from zero to five. Significantly, the reaction results have yielded syngas as main gaseous products with H_2:CO ratios always below than 2.0 with concomitant maximum 96% glycerol conversion obtained at the CO_2-to-glycerol ratio of 1.67. In addition, the glycerol consumption rate can be adequately captured using power law modelling with the order of reactions equal 0.72 and 0.14 with respect to glycerol and CO_2 whilst the activation energy was 35.0 kJ mol^{-1}. A 72 h longevity run moreover revealed that the catalyst gave a stable catalytic performance.

KEYWORDS: Glycerol; Dry reforming; Lanthanum; Nickel catalyst; Syngas

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