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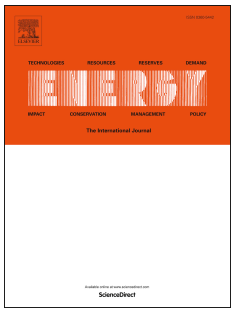

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Autothermal Reforming Process for Efficient Hydrogen Production from Crude Glycerol using Nickel supported Catalyst: Parametric and Statistical Analyses

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Abstract

In this work, crude glycerol was reformed over modified cerium-zirconium supports loaded with 5 wt% nickel catalyst by a combination of partial oxidation and steam reforming reactions to generate hydrogen via an auto-thermal process. Amongst the tested promoter elements, calcium showed the highest capability of enhancing the activity of the catalyst. Likewise, the composition of crude glycerol mixture generated at biodiesel plants, free glycerol, methanol, soap, free fatty acids and ashes (NaCl and KCl) were contained in the synthetic CG. The effects of reforming temperature, steam-to-carbon ratio (S/C), oxygen-to-carbon ratio (O/C), reduction temperature and calcination temperature were studied in a packed bed tubular reactor (PBTR). A reforming temperature of 550°C, S/C of 2.6, O/C of 0.50, reduction temperature of 600°C and calcination temperature of 550°C were experimentally revealed as the optimum operating conditions. A statistical analysis was subsequently performed to quantify the significance of each factor on the overall performance.

Keywords: Crude glycerol, autothermal reforming, statistical analysis, parametric study, metal oxide catalysts