Ni supported on modified CeO_2 for steam reforming of bio-glycerol for the production of hydrogen

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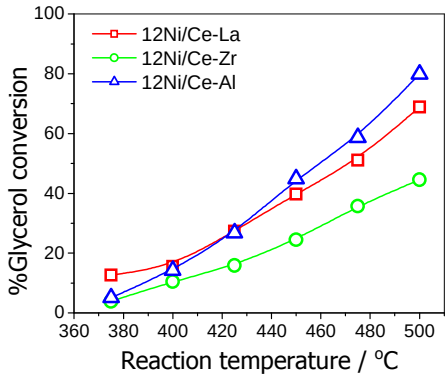
Abstract

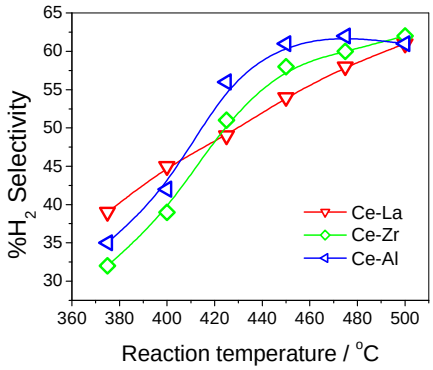
Bio-glycerol is a by product obtained during bio-diesel production. Such glycerol is a potential feed stock for the production of hydrogen, syn gas (H_2 + CO) and hydrocarbons by pyrolysis, steam gasification and catalytic steam reforming processes [1]. Syngas with hydrogen and carbon monoxide ratio of 2:1 is a suitable feedstock for Fischer-Tropsch synthesis to produce green diesel (long chain hydrocarbons) with high cetane number [2]. This work report the low temperature steam reforming of aqueous glycerol for the production of hydrogen over Ni supported on modified CeO_2 catalysts. The glycerol steam reforming process takes place according to the following stoichiometric equation:

$$C_3H_8O_3 + 3H_2O \longrightarrow 3CO_2 + 7H_2 \quad (\Delta H^\circ = +346.4 kJ/mol)$$

Several studies focused on hydrogen production from glycerol. Zhang et al. [3] performed glycerol steam reforming reaction over ceria-supported metal catalysts. They have reported that the Ir/CeO_2 catalyst displayed complete glycerol conversion at 400 °C, whereas the complete conversion over Co/CeO_2 and Ni/CeO_2 occurred at 425 and 450 °C respectively. Similarly, Dauenhauer et al. [4] produced H_2 via an autothermal steam reforming of glycerol over $Rh\text{-}Ce/Al_2O_3$ catalyst. Most of the studies explored glycerol reforming over expensive noble metal catalysts. In this investigation we have focused on the steam reforming of bio-glycerol over Ni supported on various mixed oxides. Our objective is to explore the possibility of using cheap (Ni based) catalysts for hydrogen production by steam reforming of bio-glycerol at low reaction temperatures.

Results





References

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