Hydrogen Production by Gasification of Glycerol in Supercritical Water over Ni-Y/Activated Charcoal

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Supercritical water gasification of glycerol as a model for crude glycerol which is generated as a byproduct in biodiesel production process was carried out in a continuous flow reactor packed with Ni-Y/AC catalyst. The Ni-Y/AC catalyst was formulated by an incipient wetness method. Effect of reaction conditions such as temperature (500-700°C), reactor residence time (2-15s), and initial glycerol concentration (0.6-2.4mol/L) on the extent of gasification and yield of gaseous products was investigated. Major constituents of gaseous product were hydrogen, carbon dioxide and methane, and trace amounts of carbon monoxide and ethane were also formed. The Ni-Y/AC catalyzed water-gas shift reaction under the reaction conditions. Gasification was sensitive to reaction temperature with complete carbon gasification at temperatures above 600°C. The higher hydrogen yield was obtained at shorter residence time and lower initial concentration of glycerol. Characterization of the Ni-Y/AC catalyst was accomplished in terms of BET surface area, carbon content, nickel oxidation, metal dispersion, and surface morphology.