Comparative Study on Supercritical Water Gasification of Pure and Crude Glycerol for Hydrogen Production using Batch Reactor

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Excessive amount of crude glycerol which found unattractive economically as byproduct of biodiesel manufacture owns a great potential to be converted into H_2 via supercritical water gasification. However, due to many impurities contained in crude glycerol such as salt, methanol, fatty acid methyl ester (FAME), etc., a comparative study of pure and crude glycerol was necessary to gain a better insight about gasification behavior of crude glycerol. Different parameters such as temperature (500-650°C), concentration (5-20 wt%) and residence time (15-120 min) were applied using batch reactor. Low concentration, high temperature, and long residence time were preferable for H2 production for both feedstocks. At 650°C,2 hr and 5wt% concentration, H_2 yield of 13.69 mmol/g and carbon gasification efficiency (CGE) around 97% were achieved for pure glycerol. However, lower CGE was still observed in crude glycerol at the optimum condition. It is confirmed that the presence of alkali salt in crude glycerol contributed to enhance water-gas-shift reaction that favor H_2 formation. However, FAME existence was suspected to be responsible for high carbon amount in form of tar/char which led to low value of CGE.