The reactor geometry effect on gasification of isooctane in supercritical water

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Gasification of isooctane, a model compound of gasoline, into hydrogen was investigated in a continuous tubular reactor under supercritical water conditions without using catalysts. The influences of reactor temperature, residence time, oxidant concentration were examined in different reactor geometrical configuration at a fixed pressure of 25 MPa. In downdraft type, the reactor was set vertically where the feeds flowed from the top and effluent flowed from the bottom while in down-up type, the reactor was tilted at inclination of 75^0 normal to surface and down up introducing the feeds to the reactor system. The major components of the produced gas were hydrogen (H2), methane (CH4), carbon dioxide (CO2) and the minor components were carbon monoxide (CO) and ethane (C2H6). The down-up configuration gave better flow rate stability of gas-liquid and hydrogen yield at almost 4 times higher compare to downdraft type. The experimental results showed that H2 yield was increased by applying higher reaction temperature, longer residence time and small amount of oxidant concentration. On the basis of this study, gasoline or heavy oil can be gasified with satisfying hydrogen yields using a compact SCW gasification system.