

Biofuel and bio-H₂ production using supercritical fluids

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Supercritical fluids can offer environmentally benign and facile reaction conditions for the production of biofuels and biohydrogen owing to their unique physical properties, including low viscosity, fast diffusion, zero surface tension, tunable physical properties, and high reactivity. This talk will be organized into two parts. The first part will cover biocrude production using supercritical ethanol. The biomass conversion, yield, and properties of biocrude depending on varying process parameters are discussed. The second part will discuss hydrotreated biodiesel (HBD) production from natural triglycerides in supercritical fluids. Lower reaction temperature, low consumption of hydrogen, and lower catalyst deactivation under the supercritical reaction condition are clearly advantageous. The third part will cover H₂ production from various feedstocks using supercritical water. The feedstocks used in this study include methanol, ethanol, glucose, glycerol, iso-octane, n-octane, n-decane, n-dodecane, n-hexadecane. Almost complete gasification of all the feedstocks were achieved at 25 MPa, 740 °C and 10 wt% with low total organic carbon values in liquid effluents. The hydrogen gas yields of each feedstock were very similar to theoretical equilibrium yields estimated by Gibbs free energy minimization.