

Biomass to fuels: Upgrading of Pyroligneous fraction of bio-oil to Second-generation bio-fuels

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Biomass is a renewable alternative route to fossil fuels. Fast pyrolysis is a potentially important route for biomass conversion to fuels. Researchers have shown that the problematic raw bio-oil properties of high acidity, high water content, lower heating value and variable viscosity are resolved by application of hydrodeoxygenation (HDO). Raw bio-oil from pine wood was fractionated to lignin rich pyroligneous fraction and sugar rich aqueous fraction. In the presence of hydrotreating/hydrotreating catalyst with high temperature and high hydrogen pressure pyrolysis yields hydrocarbons and water. The hydrocarbons produced in the HDO pyroligneous fraction range from naphtha to diesel weight, at relatively wide range. We performed simulated distillation of HDO bio-oil to determine the potential for producing relatively clean hydrocarbon fractions with relatively little overlap in molecular weight. The upgraded bio-oil and distilled fractions were characterized by GC/MS, FT-IR, NMR, and elemental analysis. Physical properties, such as higher heating value, viscosity, density, water content, and acid value, were also determined.

Keywords: Fast pyrolysis, hydrodeoxygenation, hydrotreating/hydrocracking catalyst and pyrolysis