DECARBOXYLATING FREE FATTY ACIDS INTO FUELS USING SUBCRITICAL WATER

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Biofuel producers are looking into new avenues for utilization of their byproducts to improve their profitability in an environmentally friendly way. The biodiesel market has become saturated with very low margins and blenders cannot utilize this product in the winter. In order to address this problem, attention has now shifted towards a range of other possible products that can be made from non-food grade byproduct oils, including green diesel (a diesel having the same analytical signature as petroleum diesel), jet fuels, and other high value products. The major goal of this work was to investigate the hydrothermal conversion of bio-oil to fuel grade hydrocarbons as green diesel. Oleic acid was selected as a model compound of bio-oil to understand the reaction chemistry. Hydrothermal reactions were carried out in a CSTR (batch mode) from 300 to 450^{o}C and reaction time was varied from 10 minutes to 6 hours. GC-FID and GC-TCD were used to analyze the liquid and gas samples, respectively. GC-TCD results showed that decarboxylation and decarbonylation of oleic acid was occurred whereas decarboxylation is the dominating chemical reaction. FTIR results also confirmed the decarboxylation of oleic acid and density measurement of the liquid proves that it falls between the diesel and kerosene.

Table 1. Specific gravity of product at different temperatures:

Temp (^{o}C)	Specific gravity
15.6	0.801
21.6	0.801
25	0.793
40	0.782

Table 2. Specific gravity of kerosene, Jet fuel and Diesel:

	Temp (^{o}C)	SG
Kerosene	15.6	0.78-0.82
Jet fuel	15.6	0.82
Diesel	15.6	0.8 to 0.88