Characterization of High Oleic Acid Biodiesel: Improving Biofuel Properties

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ABSTRACT

In 2016, the world produced an amount of biofuel equivalent to 82,306,000 tonnes of oil. A portion of the biofuels produced was categorized as biodiesel. While still growing as a fuel alternative, current biodiesel fuels are at risk for causing increased engine coking, lower engine performance and durability, oil ring sticking, carbon deposits, and gelling of lubricating oil. Due to these primary issues, biodiesel cannot completely replace petroleum diesel as a fuel source. Instead, biodiesel is commonly blended with petroleum diesel at 5% and 20% (B5 and B20) in the U.S. to create a mixture that has acceptable fuel properties.

Recently, genetic modifications to soybeans have made high oleic acid soybean oil commercially available. High oleic acid soybean oil has less saturated fat and more monounsaturated fat. This characteristic is hypothesized to improve the fuel properties of biodiesel. These improvements may enable better fuel performance such that higher blends of biodiesel could be used in combustion engines around the world. The research conducted in this study aimed to test the kinematic viscosity, density, flash point, cloud point, and acid number of transesterified high oleic acid soybean oil in order to have a proof of concept that high oleic acid biodiesel meets standard specifications. High oleic acid biodiesel was found to have a kinematic viscosity of 4.639 mm²/s, a density of 0.8789 g/cm³, a flash point >110 degrees Celsius, a cloud point of -1 degree Celsius, and an acid number of 0.071 mg KOH/g which meets every ASTM standard specification range.

KEYWORDS

Biodiesel, Fuel Properties, Sustainability, Renewable Energy, Transesterification