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A SURVEY ON ADVANCEMENT & OPTIMIZATION OF FATTY ESTER COMPOSITION TO IMPROVE THE FUEL QUALITY

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ABSTRACT

Biodiesel is a domestic and renewable alternative with the potential to replace some of the petro diesel market. It is obtained from vegetable oils, animal fats, or other sources with a significant content of triacylglycerols by means of a transesterification reaction. The fatty acid profile of biodiesel thus corresponds to that of the parent oil or fat and is a major factor influencing fuel properties. Besides being renewable and of domestic origin, advantages of biodiesel compared to petro diesel include biodegradability, higher flash point, reduction of most regulated exhaust emissions, miscibility in all ratios with petro diesel, compatibility with the existing fuel distribution infrastructure, and inherent lubricity. Technical problems with biodiesel include oxidative stability, cold flow, and increased NO_x exhaust emissions. Solutions to one of these problems often entail increasing the problematic behavior of another property and have included the use of additives or modifying the fatty acid composition, either through physical processes, such as winterization, or through genetic modification & recent developments in fatty acids.

Key words: Biodiesel, flash point , fatty acid ,algae, cetane, viscosity etc.

1. INTRODUCTION

The replacement of fossil fuels to secure future energy supplies continues to be a major as concern. In this connection, biodiesel1,2 is an alternative to petroleum-based diesel fuel (petro diesel). The demand for liquid fuels in transport is rising. Nowadays, fatty acid methyl esters (FAME) are accepted liquid biofuels for diesel engines. They are usually prepared from vegetable oils or animal fats. As these articles are dedicated mainly for consumption, other renewable sources of natural triacylglycerols (TAG) are sought .Some biodiesel standards are ASTM D6751 (ASTM=American Society for Testing and Materials) and the European standard EN 14214, which was developed from previously existing standards in individual European countries

The properties of a biodiesel fuel that are determined by the structure of its component fatty esters include ignition quality, heat of combustion, cold flow, oxidative stability, viscosity and lubricity. The present work discusses the influence of the structure of fatty esters on these properties. Not all of these properties have been included as specifications in biodiesel standards, although all of them are essential to the proper functioning of the fuel.

1.1 WHAT IS FATTY ESTER COMPOSITION?

Fatty acid esters (FAEs) are a type of ester that result from the combination of a fatty acid with an alcohol. When the alcohol component is glycerol, the fatty acid esters produced can be monoglycerides, diglycerides, or triglycerides. Dietary fats are chemically triglycerides.

Glycerol esters of fatty acids occur as colorless to brown powders, flakes, coarse powders, or granular or waxy lumps, or are a colorless to brown semi-fluids or liquids. They are odorless or have a characteristic odor.[1]

Biodiesels are typically fatty acid esters produced by the transesterification of vegetable fats and oils which results in the replacement of the glycerol component with a different alcohol.

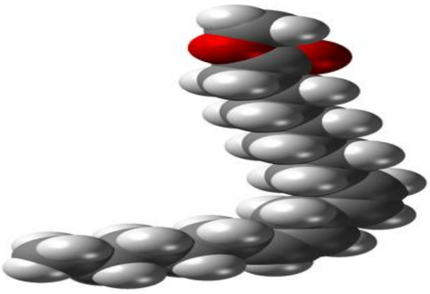

Fig1.1 Fatty acid composition

Fatty acid methyl esters (FAME) are esters of fatty acids. The physical characteristics of fatty acid esters are closer to those of fossil diesel fuels than pure vegetable oils, but properties depend on the type of vegetable oil. A mixture of different fatty acid methyl esters is commonly referred to as biodiesel, which is a renewable alternative fuel. FAME has physical properties similar to those of conventional diesel. It is also non-toxic and biodegradable.[2]

Fatty acid ethyl esters are biomarkers for the consumption of ethanol (alcoholic beverages)

2. ADVANCEMENT

2.1 RECENT DEVLOPMENT IN FATTY ACIDS

AS number of other development in fatty acids field have occurred within the past 30 years or so biotechnology and the use of enzymes to modify fats, oil, and fatty acids have and are revolutionized the entire fats and oi; industry. Once thought impossible, the use of enzymes in addible oil processing has become a reality.

Table 2.1. Specifications in Biodiesel Standards That Are Directly Influenced by the Fatty Acid Profile of the Biodiesel Fuel

Specification	ASTM D6751	EN 14214
cetane number	47 minimum	51 minimum
kinematic viscosity at 40 °C (mm2/s)	1.9– 6.0	3.5–5.0
cold-filter plugging point		not specified; depends upon the location and time of year

The above table 2.1 shows the specification of different bio diesel Fatty acids, such as cetane number, kinematic viscosity and cold filter plugging point.

Table 2.2. Fatty Acid Profiles of Some Common Vegetable Oils Used or Suggested as Biodiesel Feed stocks

vegetable oil	**C16:0*b***	**C18:0*b***	**C18:1*b***	**C18:2*b***	**C18:3*b***	**other**
castor*c*	1	1	3	4		C18:1, 12-OH
coconut	7.5–10.5	1–3.5	5–8	1–2.6		C8:0, 4.6–10.0; C10:0, 5.0–10.0; C12:0, 44–53%; C14:0, 13–20.6%
cottonseed	22–26	2–3	15–22	47–58		
palm	40–47	3–6	36–44	6–12		
peanut	6–14	2–6	36.4–67.1	13–43		
rapeseed (canola)*b*	2–6	4–6	52–65	18–25	10–11	
soybean	10–12	3–5	18–26	49–57	6–9	

The above Table 2.2 shows the different vegetable oils to improve the fuel quality.

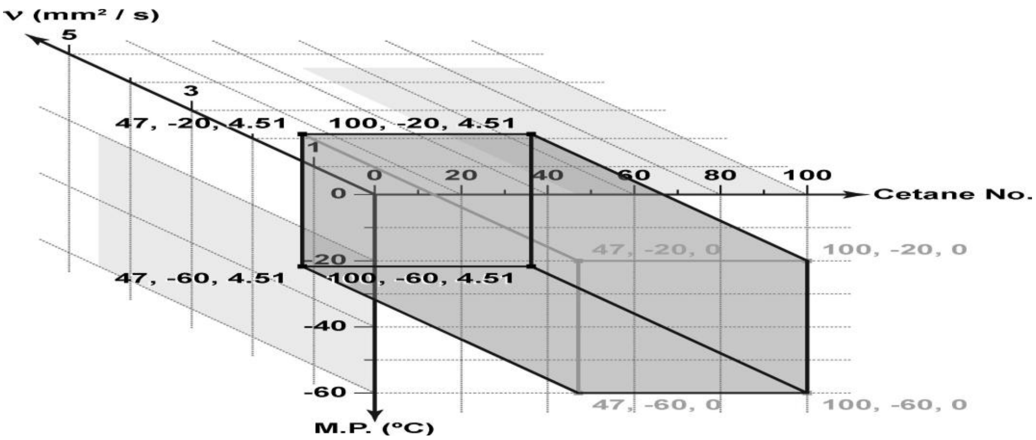

Fig1.2 cetane number diagram

Plot of the cetane number for the minimum value prescribed in ASTM D6751 and kinematic viscosity (40 °C, mm2/s), as well asmelting point for values of methyl oleate. Any compound whose data points are located within the shaded box would perform as well or better than methyl oleate regarding these properties used as base fuel. of all biodiesel-related fuels tested (besides technical-grade methyl oleate and commercial biodiesel, also neat methyl palmitate and neat methyl laurite were investigated),technical-grade methyl oleate reduced regulated hydrocarbon and CO emissions the most. The reduction in particulate matter through the use of technicalgrademetholeatewas the least of all esters tested but still significantly greater than that of alkanets, which would major components of "ultra-clean"petrodiesel fuels. For purposes of visualization, Figure 1 is a three-dimensional plot of the cetane number, melting point, and kinematic viscosity. Minimum requirements for these properties are given in Figure 1as defined by a cetane number of 47 (the minimum requirement in ASTM D6751), kinematic viscosity of 4.51mm2/s at 40 °C (the kinematic viscosity of methyl oleate), and-20 °C (the melting point of methyl oleate). It is assumed that the oxidative stability of other suitable compounds is comparable to or better than that of methyl oleate. The data points of the neat fatty compounds that would meet these requirements are contained in the shaded rectangular box arising from the minimum requirements. Note that a minimum cetane number of51 (as required in the European biodiesel standard EN 14214) would also be acceptable for this figure and would lead to a slightly smaller box.

The question that arises and which is dealt with in the following text, especially as a result of the cold-flow and Oxidation stability properties, is if other compounds may possess some advantages regarding one or more of these properties compared to methyl oleate.

Applications

1. It is very effective to reduce CO2 emission.
2. The purpose of this Paper is to produce a light-duty biodiesel truck which can be suitable for emission regulation in next generation.
3. The above survey helps us to improve the quality of fuel.
4. It is available easily.
5. Its eco friendly as compared to petrol, diesel fuels.

CONCLUSION

Bio-fuels are important because they replace petroleum fuels. There are many benefits for the environment, economy and consumers in using bio-oil can be used as a substitute for fossil to generate heat, power and chemical. Several approaches exist for improving the properties of biodiesel fuels by modifying fuel composition. The use of esters other than methanol and physical procedures, such as winterization, improve cold flow, with economics being an issue when using other alcohols and reduced oxidative stability and cetane numbers being issues in the case of winterization. Inherent genetic modification of the fatty acid profile offers the best possibility of addressing several or all fuel property issues simultaneously.

Acknowledgment

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