

Preparation and Characterization of Soap Nut Biodiesel

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Abstract--- Biodiesel is an alternative fuel sources which is used in engine. Biodiesel produced from animal fat, waste cooking oil, and soap-nut oil (*sapindus mukorossi*), soybean, jetropha oil etc. Biodiesel is very useful for developing India because Biodiesel is useful for environment. we know the diesel, and petrol are fossil fuels they will exhaust in future that's why we need to focus on Biodiesel which is renewable energy sources the method to make biodiesel is first Esterification of soap-nut oil, methanol and H_2SO_4 added with soap-nut oil at 60 °C reaction time for 1h. The base catalyst KOH was used in transesterification to convert the soap-nut oil into biodiesel. In this research paper testing the viscosity before the transesterification and after the transesterification.

Keywords--- Soap-Nut Oil (*Sapindus Mukorossi*), Esterification, Transesterification, Biodiesel.

I. INTRODUCTION

Biodiesel is prepared from used cooking oils, non-edible oils, which is renewable energy sources. The basic source of energy like petroleum, diesel is nonrenewable energy source of energy which is decreasing worldwide so the biodiesel is more essential fuel for future use.

Now a day's pollution of the atmosphere are in increasing order. Biodiesel is one of the better sources of energy which have the potential to reduce the amount of HC, CO, etc. the biodiesel is used as an alternative fuel in diesel engine without major modifications.

The major property of soap nut biodiesel are kinematic viscosity, density, calorific value, specific gravity in the present investigation, the B20,B25,B50 blends are used as fuel.

II. MATERIALS AND METHODS

The materials which are used to prepare soap-nut (*sapindus mukorossi*) Biodiesel are as follows.

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Fig 1:- Soapnut fruit and seed

1. Soap-nut (*Sapindus mukorossi*) oil.
2. Sulphuric acid (H_2SO_4)
3. Potassium hydroxide (KOH).
4. Methanol.

SOAPNUT: - Soap nut is the fruit, seed of the soap nut tree which is generally found in tropical and sub-tropical climate areas in various part of the world including Asia, America and Europe. The soap nut oil has been considered as non edible oil which is having the significance potential for the biodiesel production. Soap nut containing following acids like rachitic acid, palmitic acid, stearic acid, eicosenoic acid, Linolenic acid, and Lgnocerc acid, patmtolec acid and other.



Fig 2: Soapnut oil

III. VISCOSITY TEST BEFORE TRANSESTERIFICATION PROCESS

Oil extracted from non-edible seeds cannot be directly used as fuel in automobile engine due to higher viscosities of oils. We are going to test kinematic viscosity of oil at room temperature (20-25 °C) by using redwood viscometer instruments viscosity of oil.



Fig 3: Experimental setup

- To determine the viscosity of oil at room temperature (20-25°C).
- the apparatus required are redwood viscometer, 50 ml receiving flask, thermometer and stop watch
- Redwood viscometer consists of cylindrical oil cup the outer side of orifice jet is convex.
- The oil cup is surrounded by a water bath with electrical heater and stirring device.



Fig 4: Soap nut oil and stopwatch

- A round flat-bottomed flask of 50ml marking, to measure 50 ml of oil flow against time.

Time=4.8 minute, $4.8 \times 60 = 288$ sec

Kinematic viscosity = $(A \cdot t - B) \cdot 10^{-6}$

Unit = m^2 / s , A, B IS Instruments constant, Here t is time.

A=.247 B= 65 when time between (85 to 2000 sec).

$$V = (.247*288 - 65/288)*10^{-6}$$

$$\text{Kinematic viscosity} = 71.136*10^{-6} \text{m}^2/\text{s}.$$

IV. VISCOSITY TEST AFTER TRANSESTERIFICATION

There are many ways and procedures to convert seed oil in Diesel like fuel but trans-esterification is the one of the best Process for production biodiesel. The transesterification process is a reversible reaction and carried out by mixing the reactants-fatty acids, alcohol and catalyst. The process has been widely used to reduce the viscosity of oil. Molar ratio to methanol is 4% with KOH is 2.5%.



Fig 5:- Experimental setup

- To determine the viscosity of oil at 45 °C.
- The Apparatus required are electrical heater, motor, stirring device and stand.
- Soap nut oil=500ml, KOH =12.5 gm, methanol=20ml.

$$\text{Kinematic viscosity- } (A*t-B/t)*10^{-6} \text{ m}^2/\text{s}.$$

$$t = 2 \text{ min, } 120 \text{ sec.}$$

$$A= .247 \text{ B}= 65$$

* Kinematic viscosity of oil after transesterification process:-

$$29.09 \times 10^{-6} \text{ m}^2/\text{s}.$$

V. ADVANTAGES DISADVANTAGES AND RESULT

Advantages

- One of the main biodiesel advantages is that it is less polluting than petroleum diesel.
- Biodiesel is a renewable energy source.
- It can also be blended with another energy resources and oil.

Disadvantages

- At present, biodiesel fuel is more expensive than petroleum diesel fuel.
- It can harm rubber houses in some engine.

VI. RESULTS

VISCOSITY TEST BEFORE TRANSESTERIFICATIO	VISCOSITY TEST AFTER TRANSESTERIFICATION
1. Formula for kinematics viscosity:- $(A*t - B/t) * 10^{-6}$	3. Formula for kinematics viscosity:- $(A*t - B/t) * 10^{-6}$
2. Kinematic viscosity :- $71.136 * 10^{-6} \text{ m}^2/\text{s}.$	4. Kinematics viscosity:- $29.09 * 10^{-6} \text{ m}^2/\text{s}.$

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