K.L.E. Society's
Basavaprabhu Kore Arts, Science and Commerce College, Chikodi – 591 201.

(Accredited at 'A' with 3.26 CGPA in 3rd Cycle of A & A)

Department of Chemistry

A PROJECT REPORT

ON

"Preparation of Bio-Diesel"

Submitted by

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CERTIFICATE

Date: 19-06-2020

This is to certify that the following students of KLE Soceity's Basavaprabhu Kore Arts, Science and Commerce College Chikodi, Department of Chemistry belonging to VI semester have successfully completed the project work titled "Preparation of Bio- Diesel" during the year 2019-20.

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ACKNOWLEDGEMENT

We express our profound gratitude and sincere thanks to our beloved teacher and project supervisor **Shri. Shantinath S. Latthe,** Chemistry Department, KLE Society's Basavaprabhu Kore Arts, Science and Commerce College Chikodi. It gives us a great pleasure to acknowledge the dedicated efforts, sustained interests, affection and all kinds of encouragement that we have received from him, throughout our project work.

We are extremely thankful to **Shri. U. R. Rajput,** Principal, KLE Society's Basavaprabhu Kore Arts, Science and Commerce College Chikodi and **Shri. S. B. Vanjire,** Head, Department of Chemistry for providing all the necessary facilities during our project work. We would also like to thank **Dr. S. M. Patil, Shri Raju, Smt G. B. Jambagi, Miss. S. D. Kotabagi and Miss. P. B. Dubale** and all the teachers of Department of Chemistry KLE's B K College Chikodi, for their keen interest, valuable discussion, everlasting encouragement, inspiring guidance and incessant help.

We specially want to thank our dear colleagues for team work, valuable discussion and cooperation.

We thank all the non-teaching staff for their help during our project work.

We owe our special gratitude to **parents,** whose blessings sacrifices and moral support made this endeavour of our reality.

Finally, we thank all those who helped us directly or indirectly to complete this work.

Date: 19-06-2020

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CONTENT

Introduction

Bio-diesel is an eco-friendly, alternative diesel fuel prepared from domestic renewable resources i.e. vegetable oils (edible or non- edible oil) and animal fats. These natural oils and fats are made up mainly of triglycerides. These triglycerides when rea w striking similarity to petroleum derived diesel and are called "Bio-diesel". As India is deficient in edible oils, non-edible oil may be material of choice for producing bio diesel. For this purpose Jatropha curcas considered as most potential source for it. Bio diesel is produced by transesterification of oil obtains from the plant.

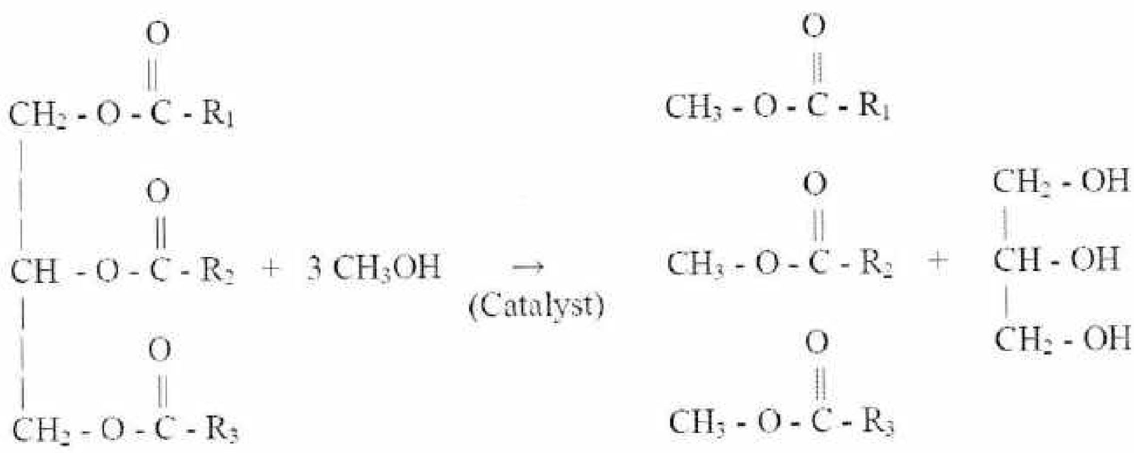
Jatropha Curcas has been identified for India as the most suitable Tree Borne Oilseed (TBO) for production of bio-diesel both in view of the non-edible oil available from it and its presence throughout the country. The capacity of Jatropha Curcas to rehabilitate degraded or dry lands, from which the poor mostly derive their sustenance, by improving land's water retention capacity, makes it additionally suitable for up-gradation of land resources. Presently, in some Indian villages, farmers are extracting oil from Jatropha and after settling and decanting it they are mixing the filtered oil with diesel fuel.

Although, so far the farmers have not observed any damage to their machinery, yet this remains to be tested and PCRA is working on it. The fact remains that this oil needs to be converted to bio-diesel through a chemical reaction – trans-esterification. This reaction is relatively simple and does not require any exotic material. IOC (R&D) has been using a laboratory scale plant of 100 kg/day capacity for trans-esterification; designing of larger capacity plants is in the offing. These large plants are useful for centralized production of bio-diesel. Production of bio-diesel in smaller plants of capacity e.g. 5 to 20 kg/day may also be started at decentralized level.

Making Biodiesel

Biodiesel is a mixture of methyl esters of fatty acids (long chain carboxylic acids). It has similar properties to the diesel fuel made from crude oil that is used to fuel many vehicles. It can be made easily from vegetable cooking oil that contains compounds of fatty acids. Enough fuel can be produced in this activity to burn in a later activity, although it is not pure enough to actually be used as fuel in a car or lorry. The synthesis is a simple chemical reaction that produces biodiesel and propane-1,2,3-triol (glycerol). Cooking oil is mixed with methanol and potassium hydroxide is added as a catalyst. The products separate into two layers, with the biodiesel on the top. The biodiesel is separated and washed, and is then ready for further experimentation.

Chemical reaction:



triglyceride methanol mixture of fatty esters glycerol

What you will need

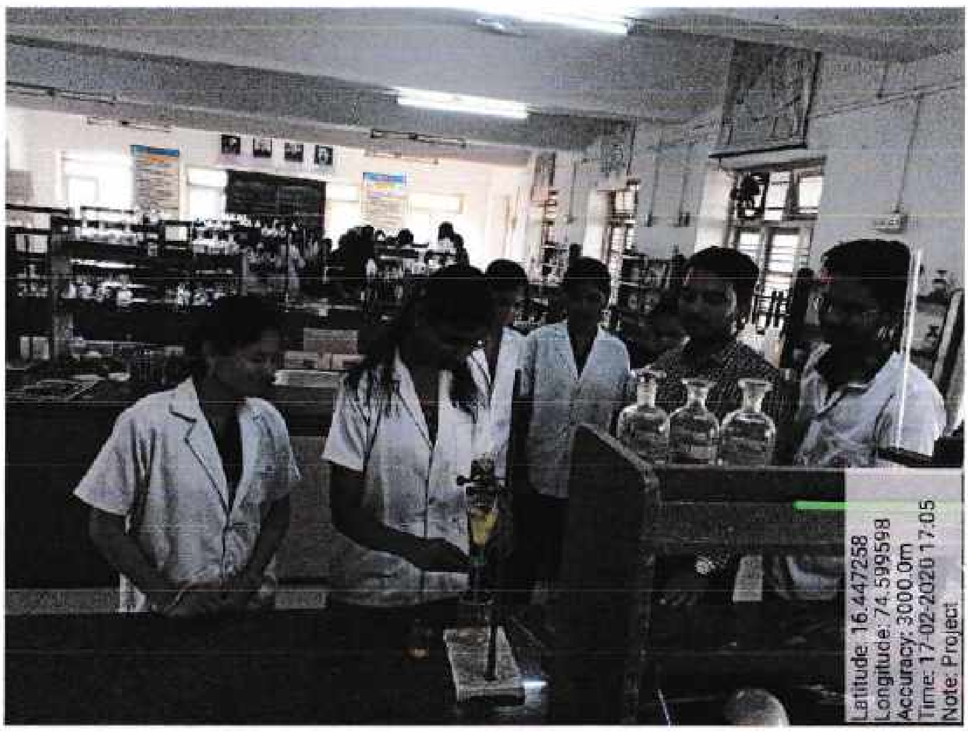
- Eye protection
- Access to a top pan balance
- One 250 cm3 conical flask

- Two 100 cm3 beakers
- One 100 cm3 measuring cylinder
- Five plastic teat pipettes
- Distilled or deionised water
- 100 cm3 vegetable-based cooking oil
- 15 cm3 methanol (highly flammable, toxic by inhalation, if swallowed, and by skin absorption)
- 1 cm3 potassium hydroxide solution 50% (corrosive).

Procedure:

1. Measure 100 cm3 of vegetable oil into the 250 cm3 flask. Weigh the flask before and after to determine the mass of oil you used.
2. Carefully add 15 cm3 of methanol.
3. Slowly add 1 cm3 of 50% potassium hydroxide.
4. Stir or swirl the mixture for 10 minutes.
5. Allow the mixture to stand until it separates into two layers.
6. Carefully remove the top layer (this is impure biodiesel) using a teat pipette.
7. Wash the product by shaking it with 10 cm3 of distilled or deionised water.
8. Allow the mixture to stand until it separates into two layers.
9. Carefully remove the top layer of biodiesel using a teat pipette.

10. Weigh the amount of biodiesel you have collected and compare it to the amount of vegetable oil you started with.



Methods of analysis and calculations

1. Calculation of Yield

In order to characterize the quantity and the quality of the produced biodiesel several techniques were utilized. The volume of biodiesel product was first measured and the volume yield percentage was calculated according to the following:

Volume Yield % = (Volume of the product/ Volume of the oil fed) 100

= (95 ml / 100) 100

= 95 %

2. Measuring density of biodiesel

Density of biodiesel is determined by specific gravity bottle method. The density is calculated

Record of Observations:

1. Weight of empty specific gravity bottle W_1 = 13.89 g

2. Weight of empty specific gravity bottle + water W_2 = 25.01 g

3. Weight of empty specific gravity bottle + Biodiesel W_3 = 23.76 g

4. Weight of water $W_W = W_2 - W_1 = 11.12$ g

5. Weight of Biodiesel $W_B = W_3 - W_1 = 9.87$ g

Determination of Density

Density of Biodiesel = Weight of Biodiesel / Weight of Water

= 9.87 / 11.12

= 0.88 g/cm^3

Conclusion

Biodiesel is currently about one and a half times more expensive than petroleum diesel fuel. Part of this cost is because the most common source of oil is the soybean, which only is only 20% oil. However, the costs of biodiesel can be reduced by making biodiesel from recycled cooking oils rather than from new soy beans, or by making it from plant matter with higher oil content.

It takes energy to produce biodiesel fuel from soy crops, including the energy of sowing, fertilizing and harvesting.

Biodiesel fuel can damage rubber hoses in some engines, particularly in cars built before 1994. You should check with the manufacturer before using biodiesel to see if you need to replace any hoses or rubber seals.

Biodiesel cleans the dirt from the engine. This dirt then collects in the fuel filter, which can clog it. Clogging occurs most often when biodiesel is first used after a period of operation with petroleum diesel, so filters should be changed after the first several hours of biodiesel use.

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Photo Gallery:

Group Photo

Density Determination

Bio-diesel

Students performing experiment