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# Production of Biodiesel from Waste Cooking Oil By Co-Solvent Method.

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**Abstract:-** Biodiesel is a mixture of mono-alkyl esters of long chain fatty acids derived from a renewable lipid feedstock. It can be used as an alternative fuel as the fossil fuels are getting depleted day by day. Moreover the use of biodiesel leads to the substantial reduction in the pollution caused by PM, HC, CO etc. This paper consists of the production of biodiesel from waste cooking oil using alkaline catalysts NAOH and KOH and co-solvent acetone in the presence of methanol. Waste cooking oil is used because of its high oil content and abundant availability. This method used is co-solvent method.

**Keywords**: acetone, biodiesel, catalyst, optimization, waste cooking oil.

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## I. INTRODUCTION

Biodiesel is an alternative fuel derived from vegetable oil or animal fat. It is obtained from renewable raw materials. It has various advantages. The emission profile of biodiesel is satisfactory and it is biodegradable. It is an ecological fuel and is not dangerous merchandise. The feedstock we use is the waste cooking oil because of its abundant availability and high oil content. Acetone is used as the co-solvent. It is a colorless, mobile, flammable liquid. The feedstock is comprised of recycled oil and grease from restaurants and food processing plants. NAOH and KOH are used as catalysts in the presence of methanol. The method we use to produce biodiesel is co-solvent method. The relevance of using co -solvent for the production of biodiesel and its effect in the reaction time, reaction temperature and yield of biodiesel is studied. The produced biodiesel from waste cooking oil are checked with the ASTM Standards to clarify the quality of biodiesel obtained in the experiment.

## II. MATERIALS AND METHODS

The materials used for the production of biodiesel are

1. Waste cooking oil
2. KOH and NAOH
3. Methanol
4. Acetone

The method employed in the production is co-solvent method and the equipment used is magnetic stirrer.

1.1 PROCEDURE


Fig1: biodiesel setup

1.11 Test 1:

Take 100 ml of preprocessed oil. Add 16 ml of methanol and 1gm of NAOH and keep the mixture in magnetic stirrer under a temperature of 60°C for 1 hour. Separate the product using separating funnel.

1.12 Test 2:

Take 100 ml of preprocessed oil. Add 16 ml of methanol and 1gm of NAOH and 1 ml of acetone keep the mixture in magnetic stirrer under a temperature of 55°C for 30 min. Separate the product using separating funnel.

1.13 Test 3:

Take 100 ml of preprocessed oil . Add 16 ml of methanol and 1gm of KOH and keep the mixture in magnetic stirrer under a temperature of 60°C for 1 hour. Separate the product using separating funnel.

1.14 Test 4:

Take 100 ml of preprocessed oil. Add 16 ml of methanol and 1gm of KOH and 1 ml of acetone keep the mixture in magnetic stirrer under a temperature of 55°C for 30 min. separate the product using separating funnel.

Biodiesel is obtained from all the tests and filter it from glycerol using a separating funnel and wash it to obtain the pure biodiesel.

The biodiesel obtained is undergone through a several processes to test its quality like cloud point, flash point, fire point etc.

**The result is checked with the ASTM Standards.**

| Sr.No | Property | units | Petrodiesel | Waste cooking oil methyl ester | ASTM(Biodiesel) |
|---|---|---|---|---|---|
| **1** | Density | $Kg/m^3$ | 820 | 880 | 870-990 |
| **2** | Fire Point | ° C | 72 | 162 | - |
| **3** | Flash Point | ° C | 66 | 158 | 130 min. |

## III. RESULTS AND DISCUSSIONS

| S.no | Catalyst used | Catalytic concentration (Wt. %) | Reaction time(min.) | Reaction temperature (° C) | Co-solvent to oil molar ratio | Biodiesel yield (vol. %) |
|---|---|---|---|---|---|---|
| **1** | NAOH | 1 | 60 | 60 | - | 97 |
| **2** | NAOH | 1 | 30 | 55 | 1 | 95 |
| **3** | KOH | 1 | 60 | 60 | - | 96 |
| **4** | KOH | 1 | 30 | 55 | 1 | 95 |

**Table: Factorial design for optimizing biodiesel.**

It is found that by using acetone as the co –solvent we can reduce the reaction time and temperature to yield almost the same volume percentage of biodiesel obtained from normal case.

The properties of biodiesel obtained is checked with the ASTM Standards

## IV. CONCLUSION

The presence of co-solvent makes the system homogeneous. The co-solvent consumed for getting high yield is very less and the reaction temperature is subsequently reduced. So this method is a relevant method which can be used for the production of high yield biodiesel. The biodiesel obtained from this method is of good quality. It can be used in its pure form or can be blended with petroleum for commercial uses. This is very cost – effective method of producing biodiesel.

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