

Making BioDiesel from Used Oil

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1 Abstract | Comparing BioDiesel Quality

To solve the global warming issue using scientific knowledge, we thought of the possibility of producing fuel from waste cooking oil and began this research. We produced biodiesel by saponification of used canola oil, however there were some problems in its quality. To improve the quality of the biodiesel, we conducted multiple tests including acid value test and soap test. Additionally, an experiment on corrosivity was also conducted to improve its performance as a diesel fuel. In the future, there is a need to conduct a lubricity test to measure its quality more accurately.

2 Background | Global Problem of Energy

Recently, fuel and oil resources are decreasing, and global warming is getting worse. We try to solve this problem by using knowledge of science. In this effort, we focus our research on "biodiesel". Biodiesel is a product produced from natural material such as plants or used products.

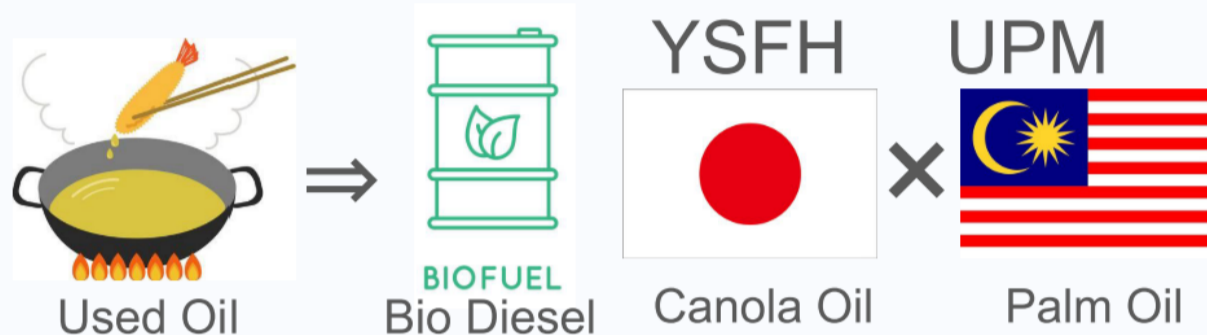


Fig.1) Purpose of our research

3 Experiment | YSF side

i .Make Biodiesel

- Used canola oil 1L
- Methanol 200mL
- KOH 3.5g

- 1 Heat oil to 60 deg.(centigrade)
- 2 Mix KOH and methanol
- 3 Pour i -3 into heated oil
- 4 Allow mixture for about 24 hours
- 5 Remove the Glycerin



Fig.2) Biodiesel before cleaning

ii .Clean bio diesel

- 1 Put hot water into the oil
- 2 Shake it for 10 minutes
- 3 Agitate it by using staler



Fig.3) After adding hot water and Agitating

iii .Test the Acid

- Biodiesel 20g
- KOH
- Ethanol 100mL
- Phenolphthalein 10spots

- 1 Mix oil, Ethanol and Phenolphthalein
- 2 Put 0.01[mol/L] of KOH into the mixture

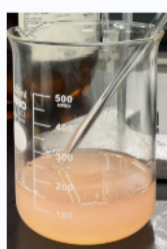


Fig.4) Titrating oil with KOH

IV .Test the soap

V .Test for corrosiveness

4 Experiment | UPM side

i .Make Biodiesel

- Used palm oil 1L
- Methanol 200mL
- KOH 3.5g

i -1~ i -5 is same with YSF side

ii .Clean bio diesel

iii .Test the Acid

- 1 Dissolve 0.5g of the oil in 50mL isoprophenol
- 2 Heat at 40 deg(C) for 30 minutes
- 3 Titrate the the biodiesel with 0.01[mol/L] of KOH

$$\text{Acid Value} = \frac{\text{Volume of catalyst used(ml)} \times \text{Normality of catalyst(ml)} \times \text{Molecular weight of catalyst(g/mol)}}{\text{Weight of oil(g)}}$$

IV .Test the soap

- 1 Dissolve 10g of oil in 100mL of isopropyl
- 2 Add 1mL 0.04% of bromophenol blue
- 3 Titrate the oil with 0.01[mol/L] of HCL

$$\text{Soap Content} = \frac{\text{Volume of HCL used(ml)} \times \text{Molarity of HCL}}{\text{Sample Mass(g)}}$$

V .Test for corrosiveness

5 View | Improve quality of biodiesel

We have not yet done the corrosion test and lubricity test on the YSF side. Therefore, we will try to test the corrosion and lubricity of biodiesel, and improve the quality.

6 Acknowledges

「Biodiesel from high-acid-value greasetrap waste: process optimization and purification using bio-based adsorbent」
— Nurhani Fatimah, Ahmad Muhaimin (2022.7)