

## Exp.06: Synthesis of biodiesel

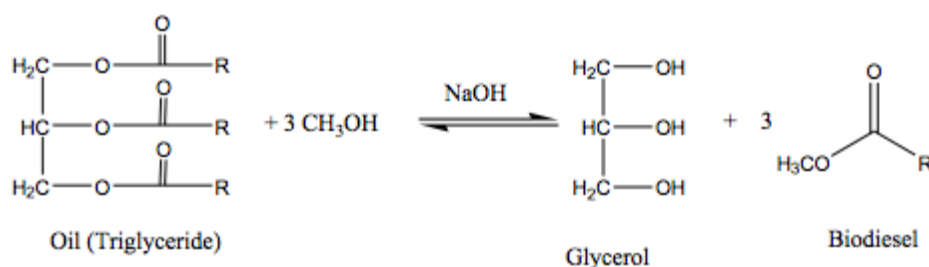
### Objectives:

- To synthesis of diesel fuel (biodiesel) from vegetable oil.
- The mechanism involves a transesterification reaction, the process of transforming one type of ester into another type of ester.

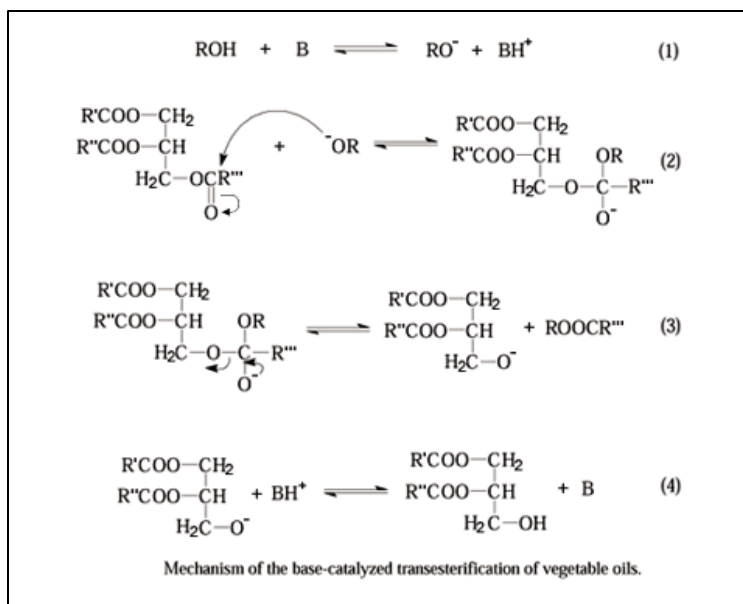
### Discussion:

Chemically, biodiesel is the methyl ester of a long-chain carboxylic acid “fatty acid”. Fatty acids are derived from fats (solids) and oils (liquid).

The hydrocarbon group, R, typically has >9 carbon atoms in an unbranched chain. It is thus a “fatty acid ester”. The hydrocarbon group chain may contain one or more cis or trans double bonds.



The reaction is catalyzed by NaOH making this process economically viable for the industrial scale production of biodiesel.



Fats and oils are tri-esters of fatty acids and glycerol, a tri-alcohol. fat/oil  $\text{R} \neq \text{R}' \neq \text{R}'' \neq \text{R}'''$ , glycerol (1, 2, 3 -propanetriol)

**The substrate (reactants):**

Compound	MP/ (BP)	Density	Hazards
Methanol	(64.7 °C)	0.79 g/mL	Flammable and poisonous.
NaOH	318 °C	1.51 g/mL	Very corrosive. Causes severe burns. May cause permanent eye damage.

**Experimental Procedures:**

1. Add anhydrous NaOH (two pellet) to pure methanol (5 ml) in a 250 ml Erlenmeyer flask and stirred vigorously until all the NaOH was dissolved.
2. Heat pure vegetable oil (25 mL) to about 40°C in a 250 mL beaker
3. Warm oil is poured into the methoxide solution with continuous stirring. At first the mixture would become cloudy, but should soon two layers would separate. This was stirred for minutes.
4. Transfer the contents of the flask were transferred into a 250 ml separating funnel. The mixture will separate into two different layers. The glycerol will fall to the top, and the methyl ester (biodiesel) will float to the bottom.
5. The separating funnel was opened, and the glycerol was allowed to drain into a small beaker.
6. Weigh the product, calculate the percentage yield. Collect to product in a paper and write your name and submit it with the report.

## Laboratory Report

Name: ----- Date: -----

Experiment Subject: -----

**Reaction:**

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**Calculations:**

Compound	Mol. Formula	Mol. Wight	Moles	Wight, mg	Density	Volume

**Physical Data (biodiesel):**

State: ----- Melting Point: -----

Color: ----- Solubility: -----

**Physical Data (glycerol):**

State: ----- Boling Point: -----

Color: ----- Solubility: -----

**Yield:**

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**Reaction Mechanism:**