**Biodiesel Synthesis**

See below for a procedure you can follow to synthesize your biodiesel. Your teacher might have some additional procedures for you to compare, or you might do your own research into biodiesel recipes and decide which one is best.

**Cautions**:

NaOH and KOH are corrosive and toxic. Methanol and ethanol are toxic.

**Introduction:**

Biodiesel is an alternative to diesel that is made from a fat (like vegetable oil) and either ethanol or methanol. The oil used in the process can come from many sources including soybeans, corn, canola, or used frying oil. Because it comes from a renewable resource, it is referred to as a biofuel. The process involves taking the oil (a fat), and combining it with an alcohol to form biodiesel. The process uses a base (either KOH or NaOH) as a catalyst to help in the process. The reaction forms two products: biodiesel and glycerol. The two products will separate into separate layers. The top layer contains the biodiesel, which can be removed and rinsed with water to remove any remaining substances. In this lab, you will be making biodiesel on a small batch scale. The usual biodiesel process is a continuous process that involves large tanks and pumps. This lab will give you an idea of what happens inside the vessels and pipes as biodiesel is being made.

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| **Reference Data** | **Density (g/mL)** | **Molar Mass (g/mol)** |
| Methanol | 0.7918 | 32.04 |
| Vegetable oil | 0.915 | 872 |
| Glycerol | 1.26 | 92.9 |
| Biodiesel | 0.88 | 292.2 |

**Procedure:**

1. Take a 50 mL Erlenmeyer flask with a stir bar and add 14 mL of pure methanol or ethanol.
2. Place the flask on a stir plate and set speed at a rate where it doesn’t splash but stirs vigorously. You can also stir the mixture with a glass stir rod if a magnetic stir plate is unavailable.
3. Slowly add 0.50 g of NaOH or KOH. Do not go over the mass of the NaOH; add carefully.
4. Observe the NaOH being completely dissolved. Once this happens, sodium methoxide is formed, a very strong and dangerous base.
5. While the sodium methoixide is being formed, place 60 mL of vegetable oil in a 200 mL beaker on a hot plate and warm to 50°C. Then place it on a stir plate with a stir bar under medium agitation, or with a glass stir rod.
6. After step 4 is complete, SLOWLY add the sodium methoxide to the warm vegetable oil. Make sure that no residual NaOH gets into the oil. The solution will be cloudy.
7. Stir the reaction mixture for 20 minutes.
8. Transfer the solution to a large test tube or graduated cylinder.
9. Allow the solution to settle for 20 minutes. The biodiesel layer will form on the top and the glycerol layer will form on the bottom. If you do not see two layers, start over being sure to add no more than 0.50 g NaOH.
10. Once the layers have stopped forming, carefully remove the biodiesel layer with a pipette and place into a graduated cylinder. Record the volume. Store your biodiesel in a beaker for further analysis.

**Waste Disposal:**

Pour all solutions down the sink with an excess of water.

**Clean-up:**

Wash all glassware with soap then rinse 3 times with tap water, and once with deionized water.