

Biodiesel Synthesis (Truman Version)

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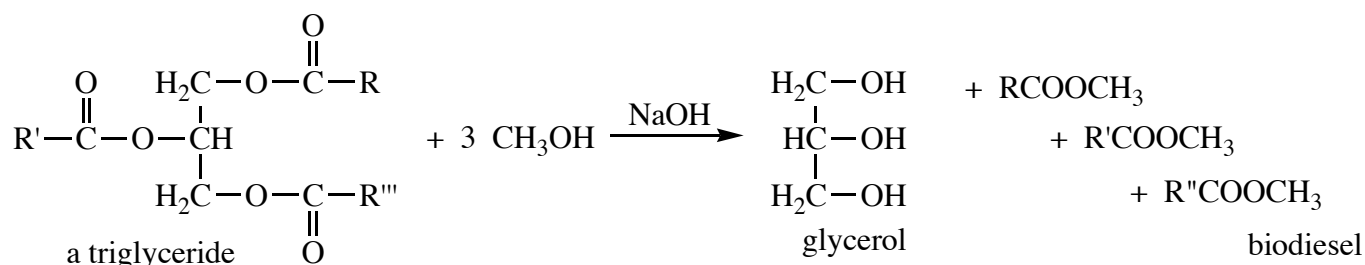
References

Adapted from: "Biodiesel Synthesis" John E. Thompson; An original submission to the GEMS Website: <http://greenchem.uoregon.edu/PDFs/GEMsID87.pdf>

Introduction and discussion

Petroleum still supplies the vast majority of our fuel needs but alternative fuels have the potential to contribute greatly to our fuel supply. Biodiesel is a mixture of the methyl esters of fatty acids derived from vegetable oils. It is biodegradable, unlike petroleum fuels, and is a renewable resource. In this experiment, we will produce a small amount of biodiesel.

All fats and oils are triesters of glycerol. The methyl esters are produced by the base promoted transesterification shown here.



Safety Concerns

NaOH is extremely caustic. Handle it with care. It is also quite hygroscopic, so please keep the bottles tightly closed when not in use.

Experimental Procedure

Put 2 mL of anhydrous methanol and a magnetic stir bar into a 50 mL Erlenmeyer. Add 0.02 g of finely ground anhydrous NaOH and stir vigorously (without heating) on your stir plate until all of the solid has dissolved.

Place 10 mL of vegetable oil in a 25 mL beaker and warm to about 50 degrees. Pour this warmed oil into the larger Erlenmeyer with the MeOH/base mixture, and stir vigorously for at least 30 minutes (without further heating). Pour the reaction mixture into your centrifuge tube, cap it, and store in your drawer until another lab day, at least one week in the future.

In about a week, the reaction mixture should completely separate into 2 phases. Since the glycerol is somewhat goeey, it does take awhile! You may need to use a centrifuge to aid the separation process. Use a pipette to remove the top layer from the tube, being careful not to mix the two layers. Take an IR of both layers to characterize them; your instructor should provide an IR of the starting vegetable oil and the methanol for analysis, too. (Since we do not know the fatty acid composition of this oil, we cannot compute a theoretical and percent yield.)

Clean-up

Check the pH of the glycerol, neutralize as needed, and flush it down the drain with lots of water. The biodiesel can also be flushed down the drain.