Testing biodiesel from corn oil

How clean is your biodiesel?

Materials

- Thermometer
- Test tube rack
- Scale
- Methanol
- Parafilm
- Ice bath
- Test tubes
- Eppendorf tubes
- Salt
- Steel wool
- Watch glass
- Matches

Instructions

3–27 conversion test

1. Measure the temperature of the biodiesel and methanol and ensure that they are both between 68 °F to 72 °F. *(Note: Temperature is extremely critical in this test. If either the biodiesel or methanol isn't the correct temperature, heat or cool them until they are.)*
2. Add 7 mL of methanol to a test tube.
3. Add 1 mL of biodiesel to the test tube.
4. Add 3 mL of biodiesel to the test tube.
5. Seal the test tube with parafilm and lightly shake test tube.
6. Let sample sit in test tube rack for 10 minutes.
7. Tip the vial at a 45-degree angle for 10–15 seconds and record if any fallout is present. If fallout is detected, it indicates that some of the oil didn't fully react into biodiesel.

pH

1. Determine pH using pH paper, universal indicator, or a pH probe and record.

Density

1. Weigh a microtube and record weight.
2. Add 1 mL of biodiesel to the microtube and re-weigh sample. Subtract the weight of the empty microtube. This will give the mass of 1 mL of biodiesel.
3. Divide the mass of the biodiesel (g) by volume of biodiesel (1 mL) to calculate the density of the biodiesel (g/mL).

Cloud point

Cloud point represents the temperature at which a liquid becomes turbid or cloudy. Because biodiesel is a mixture of a variety of esters, it is extremely difficult to clearly define a freezing point. The cloud point is an indication of the temperature when solid fractions appear in the solution. This is important because fuels must remain liquid to pass through fuel filters and to function in a diesel engine even at cold winter temperatures.

1. Prepare an ice bath (using salt in the bath will allow lower temperatures to be tested).
2. Add approximately 5 mL of biodiesel each to two large test tubes.
3. Place a thermometer in 1 of the test tubes and place test tube in the ice bath.
4. Remove the test tube from the bath every few seconds to check the solution for cloudiness using the second test tube as a reference point.

5. Since the temperatures may be cold enough to cause condensation on the surface of the test tube, check for cloudiness immediately after removing the test tube from the ice bath.
6. Continue this process until the biodiesel becomes cloudy.
7. Record the temperatures of the biodiesel. Warm the sample back to room temperature and repeat step 4 a minimum of three times.

Flame test

1. Obtain a small wad of clean steel wool. Fluff the steel wool to the size of a ping pong ball.
2. Place the steel wool on a watch glass and determine the total mass.
3. Place 5–10 drops of your biodiesel on the steel wool.
4. Determine the mass of the biodiesel used.
5. Take the watch glass and steel wool to the fume hood. Ignite the sample with a match.
6. Record the time it takes for the sample to burn, the color of the flames, and if any smoke or soot is observed.
7. Does the burning biodiesel have any odor? Allow the residue and watch glass to cool. Determine the residual mass of the biodiesel after combustion.

Biodiesel testing

Fall out	**Density**	**Cloud point**	**pH**	**Color**
	Odor	**Flame color** **Flame test**	**Time to ignite**	**Smoke color**

Reflection

1. Did you observe fallout in the 3–27 conversion test? How does this observation relate to the transesterification efficiency of your biodiesel?
2. What methods can you employ to improve the efficiency of the transesterification process? Use your data to support your claims.