

Making Biodiesel

Testing Biodiesel for Chemical Properties

How might biodiesel from different feedstocks be compared?

Materials

thermometer
test tube rack
pH indicator
cotton swabs
bunsen burner
scale
methanol
parafilm
ice bath
test tubes
microtubes
food coloring
salt

Procedures

Physical Properties

1. Record color of each biodiesel sample
2. Record odor of each biodiesel sample

pH

1. Determine using traditional methods of pH paper, universal indicator, or a pH probe.
2. Record pH level in data table.

Ignition Test

1. Soak a cotton swab in the biodiesel for 30 seconds.
2. Place the soaked cotton swab into a lit bunsen burner and time how long it takes to light.
3. Repeat this procedure for 3 trials and record the average in the data table.

Burn Time / Flame Color / Smoke Color

1. Soak a cotton swab in the biodiesel for 30 seconds.
2. Place the soaked cotton swab into a lit bunsen burner and place lit cotton swab on a watch glass to record how long it takes the swab tip to burn out.
3. Also record Flame Color and Smoke Color (make visual observations of burning).
4. Repeat this procedure for 3 trials and record the average in data table.

Density

1. Weigh an microtube and record weight.
2. Then add 1 mL of biodiesel to microtube and re-weigh sample. Subtract the weight of the empty microtube. This will give the mass of 1 mL of biodiesel.

Making Biodiesel

3. Divide mass of the biodiesel (g) by volume of biodiesel (1mL) to calculate density of the biodiesel (g/mL).

Cold Flow Test

1. Add 1 mL of biodiesel sample to a microtube.
2. Place the microtube of biodiesel into the refrigerator for 15 min.
3. Remove the tube and invert the tube to see if the biodiesel moves.
4. Record if the biodiesel flows back and forth in the data table.
5. Place the microtube into the freezer for 15 minutes.
6. Remove the tube and invert the tube to see if the biodiesel moves.
7. Record if the biodiesel flows back and forth in the data table.
8. Repeat for additional samples.

Water Test

1. Add 1 mL of biodiesel sample into a microtube.
2. Add one drop of food color into tube.
3. If drop stays intact, there is very little water in the sample.
4. If drop begins to disperse color, there is water in the sample and it may not burn well.

Cloud Point

Cloud point represents the temperature at which a liquid becomes turbid or cloudy. Because biodiesels are a mixture of a variety of esters, it is extremely difficult to clearly defined 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.

Procedure

1. Prepare an ice bath (using salt in the bath will allow lower temperatures to be tested).
2. Add approximately 5 mL biodiesel each to 2 large test tubes.
3. Place a thermometer in 1 of the test tubes and place 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 sample.
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 tube from the ice bath.
6. Continue this process until the biodiesel becomes cloudy.
7. Record the temperature of the biodiesel. Warm the sample back to room temperature and repeat step 4 a minimum of 3 times.

3-27 Conversion Test

***This test uses methanol and needs to be performed under a fume hood.**

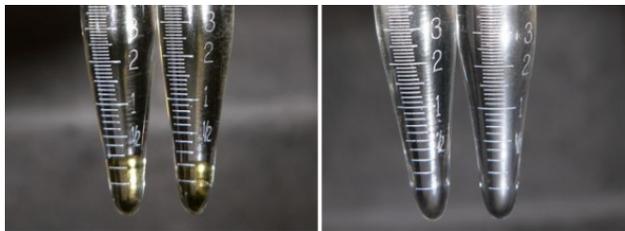
1. Measure the temperature of the Biodiesel and Methanol and ensure that they are both between 68° F to 72° F. (**IMPORTANT: Temperature is extremely critical in this test. If either**



Making Biodiesel

the Biodiesel or Methanol isn't the correct temperature, heat or cool them until they are.)

2. Add 27 mL of methanol to a large test tube
3. Add 3 mL of biodiesel to the test tube.
4. Seal the test tube with parafilm and lightly shake test tube.
5. Let sample sit in test tube rack for 10 minutes.
6. 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. If no fallout is seen, then the reaction went well.
7. Repeat steps 1-6 with other sample.



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