Soy-stainable

Making soy candles

Is there a more SoyStainable candle? Are there benefits to a candle that uses a sustainable product?

The FDA does not require candle makers to list the ingredients of a candle, so a consumer really doesn't know what materials candles are made from unless it is listed on the label. The three major products used for candle making are soy, paraffin, and palm oil. Paraffin is a byproduct of petroleum, a non-renewable resource. According to a study by the South Carolina State University in 2009[3.], the chemicals found in the fumes of paraffin candles are linked to cancer, birth defects, and such respiratory ailments as asthma. According to ehow[2.], wax is extracted or refined from crude oil and boiled for purification. It may be mixed with stearin to help with hardening. When paraffin candles burn, they emit a black soot similar to the chemistry in diesel exhaust.

Palm oil comes from the palm tree which is a renewable resource. Palm oil is one the most efficient oil-producing plants in the world. Plantations are profitable and provide people with jobs. When it come to the world of sustainable agriculture, however, palm oil does not do very well. According to RSPO[4.] (Roundtable for Sustainable Palm Oil) only 19% of palm trees are grown outside of Malaysia and Indonesia, and those palm fields are causing mass destruction and deforestation.

Soy oil is extracted from soybeans that are grow each year. The oil is hydrogenated to be made into wax. Each soy wax manufacturer may have different ingredients they add to make the wax[2.].

[1.] Crall, Desi (2017). How to make soy wax from soybeans. Retrieved from https://www.ehow.com/how_4423083_make-soy-wax-from-soybeans.html October, 2019.
[2.] Harding, Deborah (n.d.) Facts on paraffin wax. Retrieved from https://www.ehow.com/about_6068059_paraffin-wax.html October, 2019.
[3.] Massoudi, R. (2009). Frequent use of certain candles produces unwanted chemicals. Retrieved from https://www.scsu.edu/news_article.aspx?news_id=832 October, 2019.
[4.] Roundtable on Sustainable Palm Oil https://www.rspo.org

Materials

3 metal candle wick centering devices (or a popsicle stick with a hole punched in the middle)
soy wax
palm wax
paraffin wax
scissors or stainless steel wick trimmer
scent (optional)
3 wicks (for small containers, CD-10 work well)
3 equal glass or metal containers
candle thermometer
digital scale
ruler
ring stand
lighter or matches
oven glove or mitt to handle hot containers
light meters
3 standard wick stickers
straw

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Procedures

Day 1 Candle Making

1. Melt wax to the corresponding temperature:

    a. Soy: Melt Point: 51.6 degrees C (125 degrees F), Melting Range: 51.6 – 57.2 degrees C (125 - 135 degrees F) if adding fragrance Add fragrance around 44.3 degrees C (110 degrees F) and pour

    b. Palm: Melt Point: 58.9 degrees C (138 degrees F), Melting Range: 65.5-82.5 degrees C (150 - 180 degrees F) if adding fragrance Add fragrance around 60 degrees C (140 degrees F) and pour

    c. Paraffin: Melt Point: 49 degrees C (120 degrees F), Melting Range: 54.4-82.2 degrees C (130 - 180 degrees F) if adding a fragrance Add around 60 degrees C (140 degrees F) and pour

2. While the wax is melting, make sure desired containers are clean. Place the wick stickers on the back of the wick tab. Next, gently place the wick tab in the center of the container. (If having trouble getting it to stick, place your wick inside a straw, flip the straw over and use it to push down the wick disc and sticker to the container bottom.)

3. Monitor the temperature of the wax. When it reaches the recommended temperature, pour an equal amount of melted soy, palm, and paraffin wax in each of the three containers.

4. Let sit in a safe place until the next day's class.

Day 2 Experiment

Cut wicks 1.5 cm above wax in each candle. (Consistency matters! Be as accurate as possible since wick length will affect flame height.)

Follow the procedures below to test burn rate, flame height, and flame brightness:

1. Burn rate:

    a. Mass each candle before burning.

    b. Carefully light each candle.

    c. Let burn for at least 24 minutes (the longer the better).

    d. Blow out each candle and carefully mass.

2. Flame height:

    a. Secure a ruler on the shaft of the ring stand so that 0cm is aligned to the base of the ring stand (tape or zip tie).

    b. Every 3 minutes, record each of the flame heights during the burn time. Example: If the flame height started at 8.4cm and went to 11.2cm then the height would be 2.8cm.

3. Flame brightness:

    a. Take off the light meter cap. Turn the power on.

    b. Place the light meter 2 inches from the flame and test the lux (the SI unit of illuminance, equal to one lumen per square meter). As the flame dances around, it changes very frequently so record the max by pushing down the max button on the device. The LED screen will also read MAX at the top. The darker the room the better results. Record every three minutes.

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Record data in the tables below:

Soy

Initial weight _____ **Final weight _____**

Time elapsed	Flame Height (cm)	Flame Brightness (lux)
0		
3		
6		
9		
12		
15		
18		
21		
24		
27		
30		

Palm

Initial weight _____ **Final weight _____**

Time elapsed	Flame Height (cm)	Flame Brightness (lux)
0		
3		
6		
9		
12		
15		
18		
21		
24		
27		
30		

Paraffin

Initial weight _____ **Final weight _____**

Time elapsed	Flame Height (cm)	Flame Brightness (lux)
0		
3		
6		
9		
12		
15		
18		
21		
24		
27		
30		

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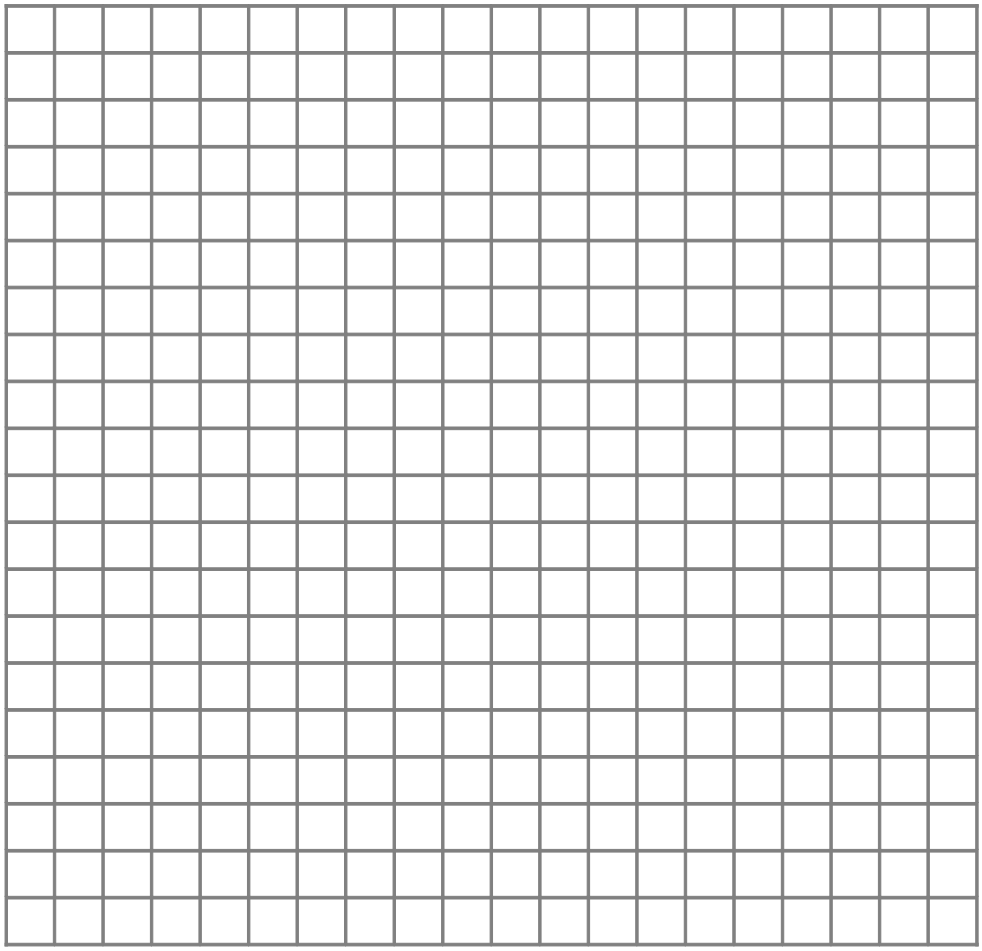
Graph results

Burn Rate



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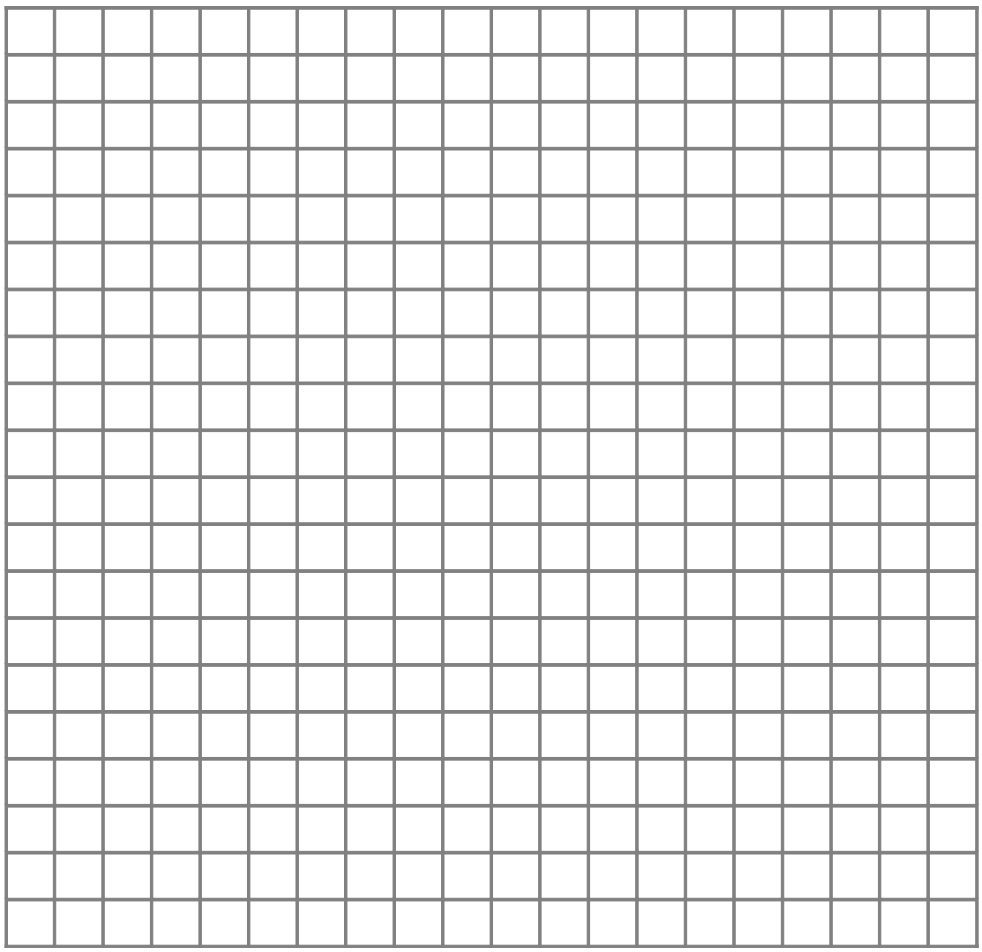
Flame height



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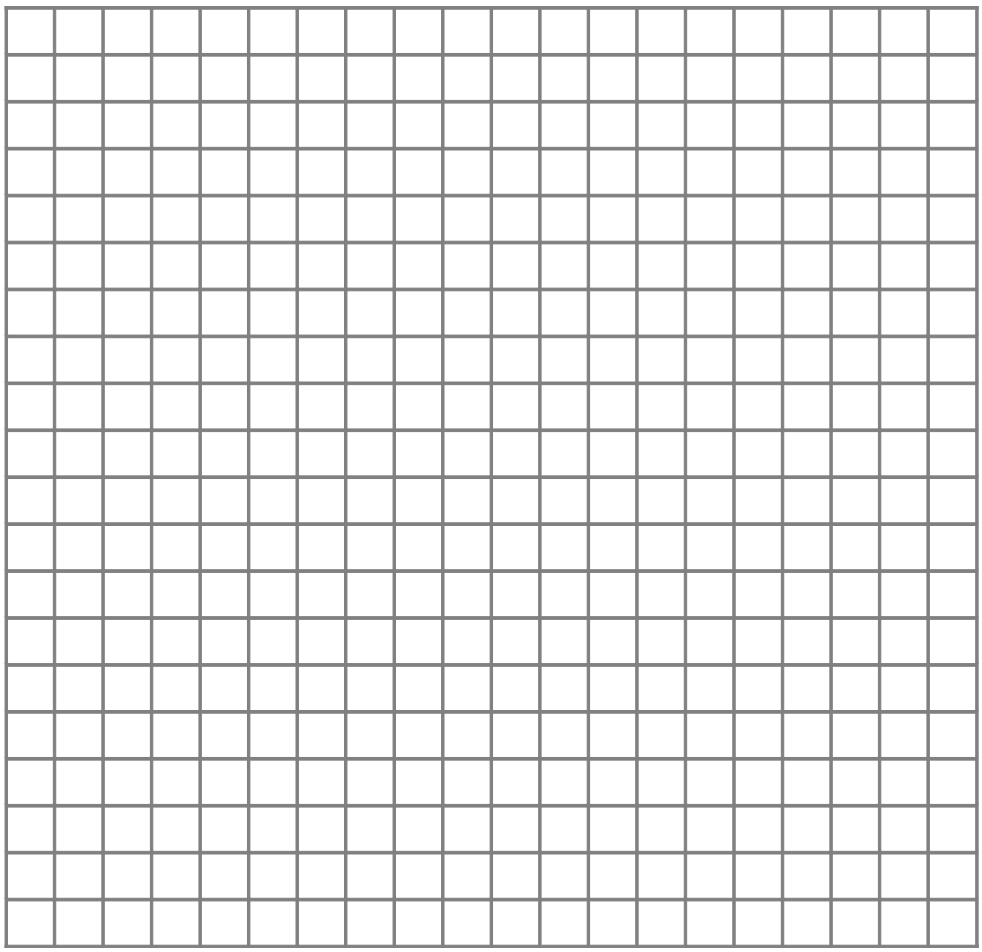
Flame Brightness



Reflection

1. Which material created a better candle? What were the major differences?

2. Describe each material in terms of being sustainable.

3. Does there seem to be a more sustainable candle. Why or why not?

4. What would you do differently to improve your experiment?