RAFT IDEAS

Topics: Physical and Chemical Changes, Chemical Reactions, Life in the Past

Materials List

- ✓ Hot beverage cup, 2
- ✓ Materials to protect the table top and people from spilled hot water and hot liquid wax
- ✓ Container or base to hold cups steady
- ✓ Palm wax, granulated
- ✓ Hot water
- ✓ Spoons, 2
- ✓ Cotton thread or string, uncolored
- ✓ Candle holder, commercial or homemade
- ✓ Optional, thermometer

This activity can be used to teach:
Next Generation Science:

- Structure of matter (Grade 5, Physical Science 1-1)
- Mixtures (Grade 5, Physical Science 1-4)
- Chemical reactions (Middle School, Physical Science 1-2)

National Curriculum for Social Studies:

- Knowledge/understanding of the past (Theme 2, Time, Continuity & Change)

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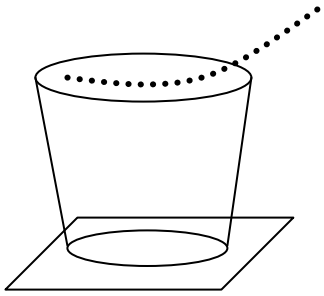
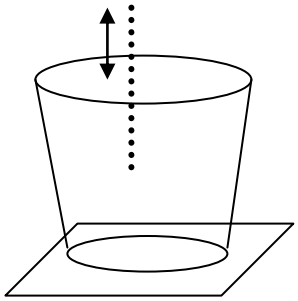
Candles from Palm Wax

Use a renewable resource to make candles the old fashion way!



Step 5



Step 7

While normally only used to create molded candles, palm wax granules can be easily melted in hot water and used to make small dipped candles in a few minutes.

To Do and Notice (Safety warning – activity uses hot water and hot liquid wax)

1. Place a heat resistant cup into a container that adds stability on a protected table.
2. Fill a cup ¾'s full with cool or cold water.
3. Fill a 2nd cup ½ full with water hot enough to make tea. Water from a water dispenser's hot water tap can be used. The water should be warmer than 65° C (150° F) but cooler than 75° C (170° F). **No open flame near the wax!**
4. Sprinkle 15 ml (1 tablespoon) of palm wax granules into the cup of hot water. Note: add the wax to the water – not the water to the wax. Stir the wax and water together while adding more hot water until the cup is ¾'s full. Continue stirring until the wax is melted. The liquid wax will float on the water.
5. Cut a 15 cm (6") length of uncolored cotton thread, or thin string. Lay the end of the thread across the diameter of the cup on top of the liquid wax, as shown.
6. When the thread has been coated with liquid wax, remove, allow the coated end to hand downward, and cool to form a straight section. A curled end can be straightened by pulling down on the coated section while the wax is still warm.
7. Dip the coated end of the thread down into the liquids in the cup, remove, dip into the cool water, and remove. Repeat until the desired diameter is achieved.
8. Each combination of dipping and cooling should add another layer of wax to the thread. Water and/or liquid wax that is too hot can actually melt the wax already on the candle rather than adding a new layer. If the candle diameter does not increase then allow the liquids to cool a little and/or vary the dipping speed.
9. As the liquid wax is removed by dipping the floating layer may thin enough to create a center opening exposing the hot water underneath. Since both liquids are clear, the absence of liquid wax may not be obvious. If more dipping is to be done then dip through the liquid wax near the rim of the cup.
10. When the candle is the desired size then invert the candle and dip the thread just above the candle into the liquid wax for a distance of about cm (3/8") or so and remove. Cut the thread just above the coated section of the wick.
11. Place the candle in an appropriate holder and, using appropriate safety precautions, light the wick. What is observed?
12. The leftover liquid wax can be allowed to cool and then the water poured away. Flexing the sides of the cup will loosen the hardened wax which can be saved and used later.

Developed and written by Michael Pollock (RAFT)

The Science Behind the Activity

Palm wax is a renewable resource derived from the oil extracted from the fruit of the oil palm. The oil refined to create in a number of food products as well as palm wax. Small quantities of the granulated form of palm wax will melt quickly and are easy to measure. The granules melted in hot beverage water will be close to the temperature at which the liquid wax will become a solid. When the thread is first dipped in the wax the fibers of the thread become coated with the wax, keeping the thread from becoming wet when later dipped into the water below the wax. As the thread is pulled from the liquid wax, the coating of liquid wax cools and hardens. The rate of cooling is greatly enhanced by dipping the wax coated thread into cold water. When the thread is again dipped and removed from the liquid wax an additional layer of wax is added. Alternately dipping the thread into the liquid wax and then the cold water will quickly increase the diameter of the candle as long as the water and liquid wax are not so hot as to melt off the wax that is already on the candle.

Many students believe that only the wick of a candle is burning. In reality, the melted wax is drawn into the exposed fabric of the wick, vaporized, burned, and converted to soot, water, and gas during the chemical reaction of combustion (a chemical reaction with oxygen). Heat and light are released during the reaction. Candles demonstrate a variety of concepts such as phase changes, physical and chemical changes, and viscosity.

Taking it Further

Compare the burning characteristics of candles made using different types of cotton thread or string such as thick, thin, twisted, or braided. Would the flame be different if the wicking material were soaked in a salt solution and then allowed to dry? How does the candle making process mimic the formation of stalactites and stalagmites.

Web Resources (Visit www.raft.net/raft-idea?isid=550 for more resources!)

- Making poured candles - http://www.raft.net/ideas/Light%20My%20Fire.pdf