



Curiosity Guide #703

Wax Science

Accompanies Curious Crew, Season 7, Episode 3 (#703)

Candle Tunneling

Investigation #8

Description

Confronted by candle craters? Fix up those faulty flames.

Materials

- Candle in a glass jar with tunnel burning. This is a used candle that has a depression or "tunnel" around the wick.
- New candle in a glass jar
- Match
- Aluminum foil
- Scissors

Procedure

- 1) Inspect the used candle with tunneled wick. Describe what you see.
- 2) Light the used candle with a match.
- 3) Cut a piece of aluminum foil. Roll the foil into a cone shape with an open top.
- 4) Wrap the base of the aluminum foil around the top of the glass jar so that the heat can transfer back into the glass from the foil.
- 5) Burn the candle until the outer part of the candle softens and melts.
- 6) Carefully remove the aluminum foil. The foil will be hot!
- 7) Compare the used candle with the new candle. What do you notice?

My Results

Explanation

A candle tunnels if the candle did not burn long enough for its initial burn. The first burn takes about an hour to melt the entire surface of the wax, so if you don't have that much time, avoid lighting the candle. The heat from the flame will always melt the area nearest the wick first and transferring that energy across the surface of the wax takes time. Blowing a candle out too soon leaves a slight trough that only gets bigger with each successive burn as the distance to the top outer edge of the candle gets further and further away from the flame. Coning the glass candle with foil allows for air to still get in, while much of the heat is conducted through the foil back to the outer edge of the candle. The wax around the outer edge can begin to melt and stop the tunneling effect. You may have to make a few attempts to get the raised wax fully melted, but once the wax is soft, you can scoop out the excess surface wax with a spoon and get the candle level for the next normal burning.

Explore further. The hydrocarbon chains in wax stick together well and don't interact with water. So, both skiers and surfers have discovered different ways to use wax to make their sports more enjoyable. Surfers wax the top of their surfboards, so the water doesn't make the board slippery, and that way the surfers don't fall off. Skiers wax the bottoms of their skis to repel the water, which makes their skis glide better in the snow when cross-country skiing. The wax will stick together even in the water so there is no need to rush to reapply a coating of wax. Have some fun! Surf's up!

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