



Curiosity Guide #607

Convection

Accompanies Curious Crew, Season 6, Episode 7 (#607)

Sinking Soap

Investigation #1

Description

Does soap always float?

Materials

- Aluminum pan
- Water
- Liquid soap with glycerol stearate. Try Ivory dish soap.
- Tablespoon
- Food coloring
- Hot plate
- 5 quarters or metal washers
- Paper towels
- Goggles
- Ice cube
- Hot mitts

Procedure

- 1) Fill the pan half full of water. Place the pan on the hot plate. Do not turn the hot plate on yet.
- 2) Add 2 tablespoons of the liquid soap and gently stir with your finger. Be careful not to create any bubbles.
- 3) Add several drops of food coloring and again stir the mixture.
- 4) Leave the mixture for several minutes to allow the soap to settle.
- 5) Turn the hot plate to a low setting.

- 6) What do you notice as the mixture heats up?
- 7) What happens if you blow on the mixture?
- 8) Try adding an ice cube. What do you observe?
- 9) What happens if you add food coloring at the edge of the pan?
- 10) Put on hot mitts and remove the pan from the heat.
- 11) What do you notice now?
- 12) Place the coins in a pattern on the surface of the hot plate.
- 13) Place the pan on the coins and heat the pan once again.
- 14) What do you notice?

My Results

Explanation

At first the heat causes the soapy water to expand. When the soapy water takes up more space, its density goes down. The mixture closer to the heat source becomes less dense and gets pushed to the surface by the columns of cooler liquid. Once the less dense liquid reaches the top of the pan, this less dense liquid cools down and sinks once more. The currents where the liquid starts to rise or sink are easier to see with the added food coloring. These currents are called convection cells. When the pan is placed on top of the coins, the contact points transfer more targeted heat so the convection currents will occur directly above the coins. Removing the pan from the heat source slows down the convection currents, but those regions also begin to get wider and easier to see. As the currents slowly descend, the border between those rising and falling liquids forms a curved dark line.

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