

Topics: Density, States of Matter, Buoyancy

Materials List

- ✓ Plastic sports water bottle or equal
- ✓ Tubing to fit in hole in water bottle cap
- ✓ Dry ice (see Yellow Pages under “ice”)
- ✓ Bubble solution (if container has a narrow neck then a tray will be needed)
- ✓ Dark color fabric pieces of wool, cotton, and blends
- ✓ Net fabric
- ✓ Safety goggles
- ✓ Glove(s), thick
- ✓ Hammer or equal
- ✓ Hot tap water
- ✓ Ice chest (to store dry ice)

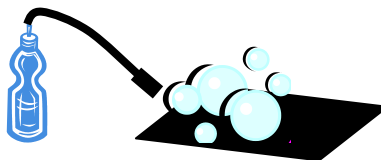
This activity can be used to teach:

Next Generation Science:

- Structure of matter (Grade 5, Physical Science 1-1)
- Properties of materials (Physical Science, Grade 2, 1-1; Grade 5, 1-3)
- Changes of state (Middle School, Physical Science 1-4)
- Chemical reactions (High School, Physical Science 1-2)

Boo Bubbles

Create “spooky” looking bubbles using dry ice!



Warmed dry ice will fill soap bubbles with a “ghostly” white mist of water droplets.

Assembly - Safety Note: Dry ice has a temperature of -78.5°C (-109.3°F), **cold enough to cause frostbite.** Use appropriate safety procedures such as:

- **Avoid contact between the dry ice and bare skin.**
 - **Do not put dry ice in a glass or a sealed container,** other than the ice chest.
 - Perform the dry ice activities **in a well-ventilated area.**
 - **Wear safety goggles as needed.**
1. To prevent a sports bottle with a push-pull cap from becoming a sealed container, when the push-pull is pushed closed, do the following modification. Remove the cap, invert, and cut the 2 side ridges and remove the center post.
 2. A sports water bottle with a hole in the cap for a plastic straw can be used as is.
 3. Insert the water bottle’s plastic straw, or tubing of an appropriate size, into the hole in the cap (or over the “spout” for a push-pull cap) so as to make a jam fit.
 4. Dip the other end of the straw/tubing into a bubble solution. Blow through the end by the cap to see if a bubble will be formed. If not then try wrapping a piece of fabric around the end of the tube to soak up more solution and/or add a section of tubing with a larger diameter, or equal, to create a larger opening.

To Do and Notice

1. Fill the water bottle about $\frac{1}{4}$ full with hot tap water.
2. Use a hammer or other tool and appropriate safety precautions to break off pieces of dry ice until the pieces are small enough to fit in to the water bottle.
3. Attach the cap to the bottle. Wait for a white mist to exit the end of the tubing.
4. Dip the loose end of the tubing into a tray of soap bubble solution (see **Web Resources** for suggested recipes). Allow a bubble to be formed.
5. Release the bubble over some fabric. The bubble **may** pop, stick (wool), or roll and even bounce as the fabric (usually all cotton) is gently moved up and down!
6. Add more dry ice and hot water to the bottle, as needed, to make more bubbles.

The Science Behind the Activity

In this activity the soap bubbles are created with a filling of cold carbon dioxide gas (CO_2), which is invisible and a mist of fine water droplets which gives the interior of the bubbles a whitish (“spooky”) appearance. Dry ice is carbon dioxide (CO_2) in the solid, frozen state. As dry ice warms up the solid CO_2 changes directly into CO_2 gas, a process known as sublimation. Sublimation is also the term used to refer to the reverse process, when a gas changes directly into a solid. The very cold CO_2 gas chills the surrounding air and causes the water vapor in the air, which is an invisible gas, to condense into a white mist of tiny water droplets. The CO_2 gas is denser than air so the CO_2 filled bubbles roll downhill and fall back down when bounced upward.

Web Resources (Visit www.raft.net/raft-idea?isid=563 for more resources!)

- Other activities & handling procedures - <http://www.dryiceinfo.com/science.htm>
- Soap bubble recipes - <http://bubbleblowers.com/homemade.html>