

Sublimation Bubbles



Get ready

Put on your safety goggles.

Observe the dry ice

Take a look at the dry ice in the container on the table. Does it look familiar? What do you observe? How is it the same or different from regular ice?



Add water

Ask the presenter to drop one piece of dry ice into a water-filled container. What happens? Do you notice anything coming out of the bottle?

The fog is safe to touch with your finger. What does it look and feel like?



Make dry ice bubbles

Take a felt strip out of the bubble solution and slowly pull it from one side of the top of the bottle to the other side to form a thin bubble film. What happens? What does your bubble look like?

You may want to rinse the bubble solution off your fingers.



SAFETY:

Dry ice is very, very cold. Do not touch the dry ice with bare skin, and always wear safety goggles.



Let's keep experimenting! Explore making more bubbles! Pop them with your fingers or catch them on the felt strip. What changes do you notice in the water as you continue to make bubbles?

Chemistry can help us understand our world and learn about how materials behave and change.

You made bubbles with dry ice! The dry ice in this activity is solid carbon dioxide. It's very, very cold (-110°F , -79°C), and as it heats up it goes through a chemical process called *sublimation*. Sublimation is where matter changes directly from a solid to a gas. You can observe this process happening right in the bottles. Look closely, and you will see how the water suddenly starts rolling as the gas escapes. The thin bubble film captures the foggy carbon dioxide gas sublimating off the dry ice submerged in the water.

Everything around us exists in different physical states or *phases of matter*. Most of the food that we eat is solid, the water that we drink is liquid, and the air we breathe is a gas. Many materials can exist in all three phases, depending on temperature and pressure. Usually, when energy is added to a solid it heats up and changes to a liquid. Then, as more energy is added, it will change into a gas. For example, ice (a solid) heats and melts into water (a liquid), which becomes water steam (a gas) when heated even more. But sometimes materials behave in surprising ways!

Chemists use tools to discover and make new things.

In 1834, a French chemist opened a pressurized container of liquid carbon dioxide, only to find that cooling from evaporation had created a solid form of carbon dioxide—dry ice! Now, chemists, engineers and other scientists work together to make dry ice that can be used in many different applications, including keeping materials cold during transport and shipping. Chemists have taken advantage of the process of sublimation in other useful materials as well. For example, mothballs sublimate at room temperature just like dry ice. The active ingredient in mothballs, *naphthalene*, changes directly from a solid to a gas and keeps moths away from your winter sweaters without staining or leaking onto the material as a liquid.



Molecules are all around us. Feel the air around us by waving your hands back and forth!



Solid gel air fresheners change directly from a solid to a gas without going through the liquid phase to make the air smell clean and fresh.

Have you ever discovered something new and exciting by accident?