Cloud in a Bottle

Demonstrate how pressure relates to cloud formation by making a cloud in a soda bottle.

Difficulty / Time Commitment:

3 out of 10

Coolness Factor:

6 out of 10

Materials:

· empty ~1 liter plastic soda bottle with cap & without label· matches· water· black construction paper or anything with dark colors (optional)

Instructions:

1. Wrap black construction paper (or anything dark) around half of the soda bottle. This step is optional.

2. Run the soda bottle under the sink and put in just enough water (~1 tablespoon) to cover up the ridges at the bottom. Not much water is needed.

3. Light a match and drop into the soda bottle and into water.

4. Quickly put the cap back onto the bottle so that the smoke doesn't escape.

5. Squeeze the soda bottle and release, repeating several times. Eventually, a cloud (condensation on the inside of the bottle) will form whenever you release, and disappear when you squeeze. Black construction paper (or anything dark) on half of the bottle may make the cloud easier to see.

What Happened?

Why did the cloud form? When we let go of the bottle after squeezing, there was low pressure inside and the cloud formed. Low pressure is typically associated with clouds because air cools when it rises and expands (when the bottle is released). When air cools, the relative humidity increases, forming a cloud. When we squeezed the bottle, the cloud disappeared because of high pressure and compressional warming with the molecules close together in the bottle. The smoke from the match we dropped in was crucial because it provided condensation nuclei on which the cloud could form. Such aerosols as smoke, pollution, and sea salt are important for water droplets to grow and form clouds.

Basic Concepts Learned:

- Clouds form under low pressure with expansional cooling as air rises, and disappear under high pressure with compressional warming as air sinks.

- Condensation nuclei from aerosols such as smoke are necessary for water droplets to grow and clouds to form.