

Properties of Gases (O₂ & CO₂)

Recommended for Chapter(s): 3 or 5

Demo #009

Materials NOT in box

1. Dry ice (dry ice holder, hammer, and bag are in the general cabinet; get dry ice from the cage near shipping a receiving).
2. Safety goggles.

Procedure

1. (Prep) Gets Styrofoam container and take it to get dry ice. The dry ice is located outside chemistry shipping and receiving. If you do not have a project code, contact Darby (feldwinn@chem.ucsb.edu) for a code to use. You will need less than 1 lb of dry ice for this demonstration.
2. (Prep) Put the dry ice in the bag and break it into small pieces using the hammer.
3. (Prep) Put a few pieces of dry ice into a 600 ml beaker and place the piece of cardboard over the top.
4. In the 500 mL Erlenmeyer flask pour approximately 100 ml of 3% H₂O₂.
5. Add 2 scoops of KI (~1 tsp) to the H₂O₂ and set it aside.
6. Ask students to predict what happens when you place a 100 ml beaker over a candle.
7. Place the 100 ml beaker over a candle until the candle goes out.
8. Have students note what happened.
9. Place a candle in the unused 400 ml beaker.
10. Tilt the beaker with the candle in it and light the candle.
11. Ask students to predict what will happen to the candle when you put dry ice around it in the beaker.
12. Use the tongs to put 2 or 3 chunks of dry ice in with the candle.
13. Have students note what happened.
14. Light a wooden coffee stirrer and the blow it out (it needs to burn long enough for an ember to remain on the end of the stick).
15. Place the wooden coffee stir into the Erlenmeyer flask containing the H₂O₂ and KI. The stirrer should relight if it does not let the flask sit for a little longer.
16. Have students note what happens.
17. Light 3 candles on the counter.
18. Ask student what they think will happen when you pour the CO₂ out of the beaker (that has not been used but has dry ice in it) onto the candle.
19. Pour the CO₂ out of the beaker onto the candle. Use the cardboard to prevent big chunks from falling out.

Safety

1. Wear safety goggles.
2. Use the tongs to handle the dry ice.

Clean Up

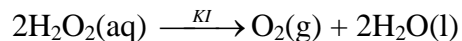
1. Return the materials to the cart in the demonstration library room.

Stockroom Notes

1. Dump solutions down the drain with plenty of water.
2. Replace the glassware with clean glassware
3. If needed refill any materials that have been used up.
 - a. If more 3% H₂O₂ is needed, make it by diluting the 30% H₂O₂ by putting in 1 part 30% H₂O₂ and 9 parts water by volume (ex: combine 10 ml 30% H₂O₂ and 90 mL of H₂O).
4. Return items to demonstration tub.
5. Return tub to the demonstration library.
 - a. Return the goggle to the goggle box.
 - b. Return dry ice container, hammer, and bag to the general cabinet.

Discussion

This demo is used to show the different properties of CO₂ and O₂. In order for a flame to exist there needs to be an oxygen environment. When the Erlenmeyer flask is placed over the candle, the candle goes out once the oxygen in the container is used up. For the second part of the demo, dry ice (CO₂) is placed in a beaker with a lit candle. As the dry ice sublimates, it produces CO₂, which is heavier than O₂, this forces the O₂ out of the beaker and extinguishes the candle. For the third part of the demo a KI catalyst is added to hydrogen peroxide resulting in the following reaction.



Due to the oxygen rich environment the coffee stirrer relights once inside the flask. The final part of the demo shows that CO₂ can be poured out of a beaker similar to water. This phenomenon happens because the CO₂ is denser than air. The candles being extinguished is a way of visualizing where the CO₂ is going.

Materials in box

1. 500 ml Erlenmeyer flask
2. 600 ml beaker
3. 400 ml beaker
4. 100 ml beaker
5. Tongs
6. KI Fisher P412-500
7. 3% H₂O₂ Fisher H324-500
8. Wooden splints
9. 4 tea light candles
10. Matches
11. Spatula
12. Cardboard cover for beaker