

Reaction in a Bag ($\text{NaHCO}_3/\text{HC}_2\text{H}_3\text{O}_2$ and $\text{NaHCO}_3/\text{CaCl}_2$)

Recommended for Chapter(s): 7

Demo #023

It is useful to do demo #022 before this demo to show the acid/base properties of CO_2

Materials NOT in box

1. Safety goggles.

Procedure

1. Pour 60 mL of 0.1 M NaHCO_3 into the 150 mL beaker.
2. Add ~5 mL of phenol red. The solution will turn red, indicating a basic solution.
3. Pour 60 mL of vinegar into the other 150 mL beaker.
4. Add ~5 mL of phenol red. The solution will turn yellow, indicating an acidic solution.
5. Show the students the following reaction:



Ask the students to predict what color will be seen in the bag when the reaction is performed.

6. Put 1 Tbsp of NaHCO_3 and ~10 mL and of phenol red into a 1 qt Ziplock bag. Close the bag most of the way leaving a small hole to pour the vinegar in.
7. Add 50 mL of $\text{HC}_2\text{H}_3\text{O}_2$ into the bag and seal the bag immediately. The solution should produce yellow bubbles but the solution itself will be red.
8. Put 1 level plastic spoonful of NaHCO_3 (baking soda) and 2 level plastic spoonfuls of CaCl_2 into a clean 1 qt Ziplock bag. Close the bag most of the way leaving a small hole to pour the phenol red in.
9. Pour 25 mL of the phenol red into the bag and immediately seal the bag. Yellow bubbles will form, the solution will be yellow, and a solid will be at the bottom of the solution.
10. Have students observe what happened and see if they can predict the reaction.

Safety

1. Wear safety goggles.

Clean Up

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

Stockroom Notes

1. Put waste down the drain.
2. Throw away bags.
3. Replace the glassware with clean glassware.
4. If needed refill any materials that have been used up.
 - a. The phenol red solution is made by dissolving 0.1 g of phenol red in the 500 mL bottle. Measurements for the phenol red solution do not need to be exact.
5. Return items to demonstration tub.
6. Return tub to the demonstration library
 - a. Return goggles to goggle box

Discussion

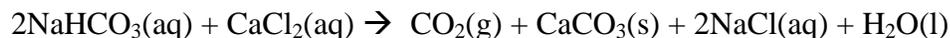
Phenol red is an indicator that is red in the presence of a base and yellow in the presence of an acid. To prove this the phenol red solution can be added to acetic acid ($\text{HC}_2\text{H}_3\text{O}_2$) and the solution will turn yellow and to sodium bicarbonate (NaHCO_3) and the solution will turn red.

The first reaction in the bag is between baking soda and vinegar and is seen below:



The formation of yellow bubbles indicates an acidic gas is formed (H_2CO_3 this comes from the interaction of $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$). The solution is red in color, therefore, the salt ($\text{NaC}_2\text{H}_3\text{O}_2$) in the solution is basic.

The second reaction that is performed is seen below:



The formation of the yellow gas indicates the presence of CO_2 . A solid is formed in the solution. The solid in the solution is CaCO_3 (chalk). The solution in this reaction is yellow. Since the salt formed is NaCl , which is neutral, there is probably a small excess of Ca^{2+} ions in solution.

Materials for demo 023

1. Baking Soda
2. CaCl_2 Leslies Pool Supplies - "Hardness Plus"
3. Vinegar
4. Phenol red Fisher AC15143-0250
5. 1 quart Baggies
6. Two 150 mL Beakers
7. Two 50 mL Graduated cylinders
8. One Tablespoon
9. Two Plastic spoons