

CHAPTER 8	Launch Lab: The Model Airbag	BLM 8.0.1
HANDOUT		

Household vinegar and baking soda react to produce carbon dioxide gas:



You can use this reaction to create a model for an air bag.

Safety Precautions

- If the bag bursts, the solution mixture could spatter.

Materials

- household white vinegar (dilute ethanoic acid, $\text{CH}_3\text{COOH}(\text{aq})$)
- baking soda (sodium hydrogencarbonate, $\text{NaHCO}_3(\text{s})$)
- resealable sandwich bag
- barometer or the latest air pressure (uncorrected)
- thermometer (alcohol or digital)
- electronic balance
- 50 mL graduated cylinder
- 50 mL beaker

Procedure

1. (a) Working in groups, use what you know about gas volume at a given pressure and temperature to calculate the amount, in moles, of $\text{CO}_2(\text{g})$ needed to fill the sandwich bag you are using. Your teacher will provide the volume of the sandwich bag.
(b) Use this result to estimate how many moles baking soda and vinegar you will need to just fill the sandwich bag with gas. Note that household vinegar is typically 5% w/v ethanoic acid in water.
(c) Calculate the mass of baking soda and vinegar needed (in grams).
2. Measure and record the air pressure with a barometer.
3. Use the thermometer to measure and record the temperature of the air.
4. Use the electronic balance to measure the mass of baking soda you predicted you would need. Put the baking soda in the sandwich bag.
5. Use the graduated cylinder to obtain the volume of household vinegar you predicted you would need.

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6. While you pinch off the corner of the bag containing the $\text{NaHCO}_3(\text{s})$, add the vinegar to the other corner and, with the aid of another student, seal the sandwich bag so that it contains as little extra air as possible.
7. Place the sealed bag in the sink and allow the reactants to mix. When the reaction stops, record your observations. Is the bag partly full, full, or did it burst?
8. Dispose of the reaction mixtures down the sink with lots of water.

Analysis

1. Share your results with the class. Which group or groups succeeded in filling their air bag and why? What errors were made by other groups?
2. Suggest two reasons why the reaction between vinegar and baking soda is not used to fill air bags for automobiles or Mars landers.