

Module 8: Thermochemistry

Topic 2 Application: Elephant's Toothpaste Scientific Investigation

Before you begin the scientific investigation below, make sure to download the Elephant's Toothpaste Scientific Investigation Report. As you complete this scientific investigation, fill in any needed information on the report template. If you need more information about each section of the report, please visit the Developmental module.

Introduction

A catalyst will accelerate the reaction. A catalyst is not a reactant or a product. Catalysts are not consumed in the reaction. The experiment you will perform produces a substance sometimes called "Elephant's Toothpaste." Please note, this substance is NOT edible, and is not safe to use as toothpaste on animals or humans. In this experiment, you will observe as a catalyst causes the decomposition of hydrogen peroxide at a rapid rate.

Objectives

In this scientific investigation, you will:

- observe the effects of a catalyst in a chemical reaction.

Hypothesis

Using the Procedure and Data Collection section below, read through the procedural information for this scientific investigation. Based on your understanding of the procedure, develop your own hypotheses which describe your expected results. You should consider the following questions: What substance will serve as a catalyst in this reaction? What do you expect to happen? Record these hypotheses in the Hypothesis section of your Elephant's Toothpaste Scientific Investigation Report.

Equipment and Materials

- A clean 16-ounce plastic soda bottle
- 1/2 cup of 3% hydrogen peroxide
- 1 tablespoon (one packet) of dry yeast
- 3 tablespoons of warm water
- Liquid dish washing soap
- Food coloring
- Small cup
- Safety goggles and gloves
- One small cup or beaker
- One spoon or stirring rod
- Funnel (optional)

Procedure

Important: Make sure to complete this experiment on a washable surface, or place the bottle on a tray. Follow proper laboratory etiquette by wearing safety goggles and gloves throughout this experiment.

1. Add 8 drops of any color food coloring into the 16-ounce bottle.

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2. Add 1 tablespoon of liquid dish soap into the bottle. Make sure that the food coloring and dish soap are mixed.
3. In a separate small cup or beaker, combine three tablespoons of warm water and one package of yeast together. Mix the two substances together for 30 seconds.
4. Pour the yeast water mixture into the bottle (using a funnel helps with this step). Allow the yeast to mix and observe what happens with the reaction.

Data

Use the area provided on your Elephant's Toothpaste Scientific Investigation Report to record any observations you had while you conducting the procedure. You should create a sketch, drawing, or image that shows the results of this experiment.

Data Analysis

In the Data Analysis section of your Elephant's Toothpaste Scientific Investigation Report, provide the responses to the following questions:

1. What substance served as the catalyst in this reaction?
2. Why did foam form? Explain.
3. Write a chemical equation for the reaction you observed?
4. What type of reaction took place?

Conclusion

Using the Conclusion section of your Elephant's Toothpaste Scientific Investigation Report, compose three to four sentences describing an overall conclusion about effects of a catalyst in the reaction you observed. Base your conclusions on your data. Were your hypotheses true or false, how do you know? Use the data and notes that you collected from your experiment to form your conclusion. Make sure that you include information that you gained from data analysis to support your conclusion.

Experimental Sources of Error

On your Elephant's Toothpaste Scientific Investigation Report, provide responses to the following questions: Are there any sources of error? If so, what are they, and what could be done to minimize error?

Once you have completed the Elephant's Toothpaste Scientific Investigation Report, please submit your work to the dropbox.