Magic Genie

Sodium Iodide

Introduction

When sodium iodide is dropped into a flask containing 30% hydrogen peroxide, a "magical" genie appears in the form of water vapor and oxygen.

Concepts

- Exothermic reaction
- Catalysts
- Decomposition reactions

Materials

Hydrogen peroxide, 30%, H_2O_2, 50 mL
Sodium iodide, NaI, 4 g
Graduated cylinder, 50-mL or 100-mL
Volumetric flask, Pyrex®, 1000-mL
Filter paper

Safety Precautions

Hydrogen peroxide, 30%, will act as an oxidizing agent with practically any substance. It deserves the science teacher's special handling and storage attention. This substance is severely corrosive to the skin, eyes and respiratory tract; a very strong oxidant; and a dangerous fire and explosion risk. Do not heat this substance. Sodium iodide is mildly toxic, LD_{50}: 4340 mg/kg. The reaction flask will get extremely hot; use only a Pyrex flask and hold with a towel around it to prevent burns. Do not point the mouth of the flask towards yourself or anyone else. Never tightly close a vessel containing hydrogen peroxide—it may explode. Wear chemical splash goggles, chemical-resistant gloves and chemical-resistant apron. Please review current Material Safety Data Sheets for additional safety, handling, and disposal information.

Procedure

1. Wrap 4 g of sodium iodide in a small piece of filter paper or tissue. Staple the filter paper so that no sodium iodide leaks out.
2. Add 50 mL of the 30% hydrogen peroxide solution to a 1000-mL Pyrex volumetric flask. ***Caution:*** Wear rubber gloves when handling 30% H_2O_2. Contact with skin may cause burns.
3. Set the flask on a counter and hold the flask with a thick cloth towel. Drop in one packet of the sodium iodide solid. Point the flask up and in a safe direction away from yourself and your students as the magic genie (water–vapor) emerges from the flask. The flask will get extremely hot. The towel will hide the flask contents as well as protect your hand from the heat produced.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures, and review all federal, state and local regulations that may apply, before proceeding. Immediately clean up any liquid that may have splattered on the floor. Pour any liquid remaining in the flask down the drain with excess water. Rinse the flask thoroughly with water. Remove any remains of the sodium iodide packet and place it in the trash.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12
Evidence, models, and explanation
Constancy, change, and measurement
Content Standards: Grades 5–8

Publication No. 738
032417

Content Standard B: Physical Science, properties and changes of properties in matter

Content Standards: Grades 9–12

Content Standard B: Physical Science, structure of atoms, structure and properties of matter, chemical reactions

Tips

- It is very important that this demonstration be done in a borosilicate (i.e., Pyrex) flask. A flask that is not borosilicate glass can crack from the evolution of heat.
- A large flask (1000-mL) is necessary because a brownish liquid can spurt out at the end of the reaction. A large flask will help prevent this from happening. The brown liquid results from the presence of free iodine produced from the extreme oxidizing ability of the 30% hydrogen peroxide.
- A thick cloth towel will prevent your students from seeing what is happening in the flask, as well as protect you from the heat evolved in the reaction. Another option is to wrap the flask in aluminum foil and decorate it like a "genie bottle". A more colorful option is to add food coloring to the flask.
- Manganese(IV) oxide can be substituted for sodium iodide in the demonstration. Both chemicals catalyze the reaction and will cause the release of oxygen from hydrogen peroxide.
- The sodium iodide packet can also be attached to a piece of thread and hung inside the flask. Attach the thread to the ou side of the flask with tape or a stopper. *Warning:* Do not use a solid stopper or cap. If the reaction starts prematurely, the pressure buildup may explode the flask. Use a one- or two-holed stopper and place it loosely on the flask.

Discussion

The Magic Genie demonstrates the decomposition of hydrogen peroxide into oxygen gas and water vapor. The decomposition is catalyzed by iodide (I^-), which is not changed during the reaction. It is an exothermic reaction and will evolve a lot of heat. The reaction is:

$$2H_2O_2(aq) \xrightarrow{I^-(aq)} 2H_2O(g) + O_2(g) + \text{Heat Energy}$$

Acknowledgment

Special thanks to Jim and Julie Ealy, The Peddie School, Hightstown, NJ, who provided us with the instructions for this activity.

Reference

Stone, Charles, H. *J. Chem. Ed.*, **1944,** *21*, 300.

Materials for *Magic Genie* are available from Flinn Scientific, Inc.

Catalog No.	Description
H0037	Hydrogen Peroxide, 30%, 100 mL
H0008	Hydrogen Peroxide, 30%, 500 mL
S0083	Sodium Iodide, 25 g
GP4045	Pyrex Volumetric Flask, 1000-mL
AP2092	Magic Genie Demonstration Kit

Consult the Flinn Scientific website for current prices.