

Glowing Fingers

Introduction

Demonstrate oxidation and chemiluminescence using simple materials.



Concepts

- Phosphorescence
- Oxidation

Materials

Matchbook

Quarter (25¢)

Safety Precautions

The substances formed on your fingers mix with water to form an acid. Phosphorus is a flammable solid and can cause skin burns. However, the quantity found on matchbooks is very small and can be handled safely. Be sure to wash hands thoroughly after this activity. Please review current Material Safety Data Sheets for additional safety, handling, and disposal information.

Procedure

1. Each student should have one quarter at their lab station.
2. Remove half of the red phosphorus strip (the striking surface) on the back of a book of matches.
3. Peel as much of the paper backing off of the red phosphorus strip as possible.
4. Fold the red phosphorus strip in a "V" shape (with the phosphorus inside) and place it on top of a quarter (Figure 1).
5. Light the top of the phosphorus strip with a match, and allow it to burn. Blow the ashes off the quarter.
6. A brown residue of white phosphorus should remain on the quarter. (The white phosphorus is brown due to the presence of carbon, etc., left over from the combustion reaction.) Wipe it up with your thumb.
7. Turn out the lights and rub your thumb and forefinger together. They should begin to glow.



Figure 1.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures governing the disposal of laboratory waste.

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

Content Standards: Grades 5–8

Content Standard B: Physical Science, properties and changes of properties in matter, motions and forces, transfer of energy

Content Standard E: Science and Technology

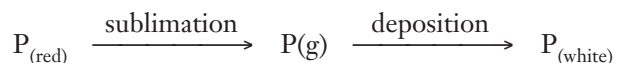
Content Standards: Grades 9–12

Content Standard B: Physical Science, structure and properties of matter, chemical reactions, motions and forces, interactions of energy and matter

Content Standard E: Science and Technology

Discussion

When the red phosphorus is heated, it sublimates into phosphorus gas. The phosphorus condenses back into solid white phosphorus when it contacts the cool surface of the quarter.



The deposited white phosphorus is covered with a thin coat of phosphorus oxide that keeps it from reacting with air. As the fingers are rubbed together, the oxide coating is removed and the white phosphorus is immediately oxidized. This reaction gives off light.



White phosphorus is commonly stored under water because of its high reactivity with air. Red phosphorus is much less reactive than white phosphorus. It is also much less toxic than white phosphorus.

White phosphorus is used in fireworks and military flares. Red phosphorus is mixed with powdered glass to form the striking surface on matchbooks. The match heads contain antimony(III) sulfide, (SbS_3), and an oxidizing agent. Friction sets off a reaction between red phosphorus and the oxidizing agent. This, in turn, ignites the antimony sulfide.

Acknowledgment

Special thanks to Penney Sconzo of The Westminster School in Atlanta, GA., for bringing this demonstration to our attention.

Reference

Byrd, D. M.; Rodgers, P.; Wheeler, L. *Colorful Chemistry Workshop*, Azle High School; Azle, TX.

Materials for *Glowing Fingers* are available from Flinn Scientific Inc.

Catalog No.	Description
AP1935	Matches, pkg./50

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.