Phosphorescent Flash Paint

Introduction

Making flash screens is a snap with Flinn's phosphorescent flash paint. No mess, no mixing, no excess paint—just open the jar and start painting! After the paint has dried, simply shine a light on it, and then turn off the lights and observe the brilliant glow!

Concepts

- Phosphorescence
- Absorption
- Emission

Materials

Phosphorescent flash paint, 200 mL
Light source—classroom lights work well
Paint brush
Wooden board, or other surface to paint

Safety Precautions

Phosphorescent flash paint is a body tissue irritant. Vapor may be harmful to eyes and mucous membranes. Contact between phosphorescent flash paint and acid liberates toxic and flammable hydrogen sulfide gas; avoid contact with acids. Wear chemical splash goggles, chemical-resistant gloves, and a chemical-resistant apron. Wash hands thoroughly with soap and water before leaving the laboratory. Please review current Material Safety Data Sheet for additional safety, handling, and disposal information.

Procedure

1. In a well-ventilated area, apply a coat of the phosphorescent flash paint to a wooden board. Set the board aside and allow it to dry.
2. Apply a second coat of the phosphorescent flash paint to the board. Set it aside and allow the second coat to dry.
3. Illuminate the painted board with regular classroom lights for 30 seconds.
4. Completely darken the room. The board will glow in the dark wherever it is coated with paint!

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures governing the disposal of laboratory waste. Dispose of any painted materials in the trash according to Flinn Suggested Disposal Method #26a. Rinse the paint brush with water.

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
Content Standard B: Physical Science, properties and changes of properties in matter, transfer of energy
Content Standards: Grades 9–12
Content Standard B: Physical Science, structure and properties of matter, interactions of energy and matter

Tips

- When the room is lighted, have a student place her hand on the board so that no light shines on the portion of the board covered by the hand. Have her hold her hand on the board for at least 30 seconds. Then completely darken the room and have the student remove her hand. Now the board will glow everywhere but where the student's hand

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was placed. Try the same procedure, but use pieces of paper cut into letters or shapes to spell a word or trace a figure.

- Surprise your students! Apply a coat of regular white paint to the board first. Then apply two coats of the phosphorescent flash paint spelling a word or drawing a figure with the phosphorescent flash paint. Under the normal classroom lights, the board will just look like a white board. When the room is darkened, however, the phosphorescent flash paint will glow, revealing the hidden word or drawing.
- Regular white paint can be used for the first coat, followed by phosphorescent flash paint for the second coat. This wil make the jar of phosphorescent flash paint go farther.

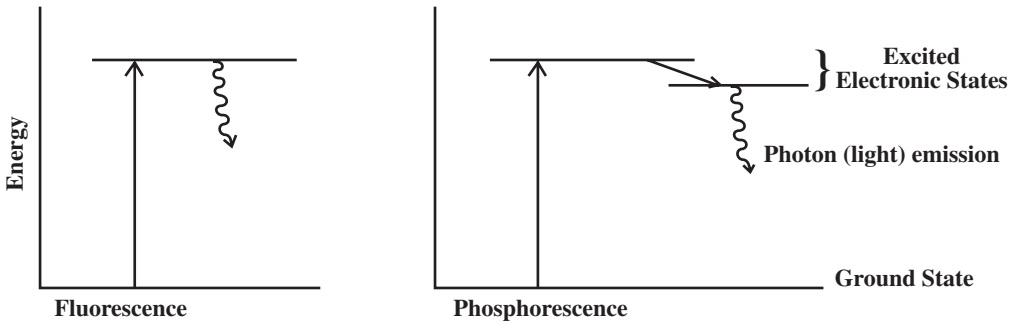
Discussion

Luminescence is the emission of radiation (light) by a substance as a result of the absorption of energy from photons, charged particles, or chemical change. It is a general term that encompasses a variety of different process, including phosphorescence, fluorescence, and chemiluminescence. *Phosphorescence* is different from the other types of luminescence in that light continues to be emitted even after the exciting source has been removed. This is sometimes referred to as the "afterglow." In this demonstration, the exciting source is the lights in your classroom. The painted board glows even after the lights have been turned off (removal of the exciting source), so flash paint can be classified as a phosphorescent material.

Why does a phosphorescent material continue to glow even after the exciting source has been removed? This can be explained by looking at an energy level diagram for a phosphorescent material. In both phosphorescence and fluorescence, a light source is shined on the material, and light energy is absorbed. The energy from the photon is transferred to an electron that makes a transition to an excited electronic state. From this excited electronic state, the electron naturally wants to return or "relax" back down to its ground state. When the electron relaxes, it does not necessarily return to the ground state in a single step. The relaxation pathway varies, and is different depending on whether the material is fluorescing or phosphorescing.

In fluorescence, the electron relaxes down to a lower energy state and emits a photon in the process. If this photon has a wavelength in the visible portion of the electromagnetic spectrum, we observe a colorful, glowing effect. This process is practically instantaneous so the fluorescence is observed as soon as the exciting source is present, and it disappears as soon as the exciting source is removed.

Energy Level Diagrams



In phosphorescence, the excited electron first makes a slow transition to another excited state very close in energy to the initial excited state. From this second excited state, the electron then relaxes down to a ground state, emitting a photon in the process. The characteristic afterglow of phosphorescence is due to the delayed emission that occurs because the transition between the two excited states is slow.

Materials for *Phosphorescent Demonstrations* are available from Flinn Scientific, Inc.

Catalog No.	Description
P0272	Phosphorescent Flash Paint
AP4794	Phosphorescent Vinyl Sheet, 12″ × 12″
AP5887	Phosphorescent Paper
AP4576	Energy in Photons Kit

Consult the Flinn Scientific website for current prices.