Holey Socks!

Chemical Safety Demonstration

Introduction

Laboratory safety rules should include wearing a chemical-resistant apron and closed-toed shoes when working with corrosive chemicals. This safety demonstration offers dramatic evidence to help students remember why these rules are important.

Concepts

- Safety rules
- Acid safety
- Personal protective equipment
- Proper dress in lab

Materials

Sulfuric acid, concentrated, H_2SO_4, 18 M, 2–3 mL
Disposable glass Pasteur pipet or medicine dropper
Glass Petri dish or large watch glass
Sock, white cotton
Video camera (optional)

Safety Precautions

Concentrated sulfuric acid is severely corrosive to eyes, skin, and other tissue. Use only small amounts in this demonstration and be sure the sock is on top of a glass dish or plate. Wear chemical splash goggles, chemical-resistant gloves, and a chemical-resistant apron. Please review current Material Safety Data Sheets for additional safety, handling, and disposal information.

Procedure

1. Wear chemical splash goggles, gloves, and an apron to set a good example.
2. Place an old white cotton sock on top of a glass Petri dish, large watch glass, or other glass dish. *(The acid will eat through the sock very quickly and the glass dish is needed to contain the acid.)*
3. Obtain approximately 2–3 mL of concentrated sulfuric acid using a disposable glass pipet.
4. Slowly add sulfuric acid dropwise onto the sock. Place the drops next to one another rather than on top of one another. Try adding the drops in various places on the sock or in the shape of an "S" or "O."
5. Observe that within 20–40 seconds the acid will "eat" through the first layer of the sock, and then begin destroying the second layer as well. Within two minutes, there will be a hole completely through the sock. There may also be a dark ring around the hole where the acid has "burned" the cotton. The hole may continue to grow for a few minutes.
6. Repeat if necessary.
7. Take the sock and dish to the sink and carefully rinse both with a large amount of water.
8. Keep the "Holey Socks" as a reminder to wear chemical-resistant aprons and closed-toed shoes when working with corrosive chemicals.

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. The amount of acid residue on the sock and in the dish is minimal and may be rinsed down the drain with a large amount of excess water according to Flinn Suggested Disposal Method #26b.

Publication No. 10360
061616

Tips

- This activity uses hazardous chemicals to demonstrate an important safety rule. Follow all directions and practice the demonstration before presenting it to your students. The demonstration should reinforce good safety procedures.
- Old, unmatched, white, cotton athletic socks work great. The older the sock the better, because there will be less cotton to eat through.
- The sock must be lying on top of a glass plate or dish to contain the acid droplets and acidic remnants from the sock.
- A presentation video camera such as the Flinn ChemCam™ will provide your students with a close-up view of this and other demonstrations.

Discussion

Concentrated sulfuric acid is severely corrosive and also a powerful dehydrating agent. The rate at which the sulfuric acid eats through the cotton is a function of both properties. Less concentrated sulfuric acid solutions and other strong acids will work but will not be as dramatic. Of course, as most chemistry teachers will attest, weaker solutions of acids and bases can still ruin clothes. There are very few chemistry teachers who do not have a lab coat or pair of pants with holes from where they splashed a chemical on themselves or leaned against a lab counter.

The purpose of this demonstration is to visually and convincingly reinforce the safety rule to always wear a chemical-resistant apron and proper attire in lab. Proper lab attire includes sturdy, closed-toe shoes and a lab coat or long pants. Take the opportunity to remind students as well about the importance of wearing chemical splash goggles and chemical-resistant gloves. Goggles, gloves, and apron are examples of *personal* protective equipment—their purpose is to protect *students!* This may also be a good time to review the purpose and the location of the safety shower and how quickly it must be used in the case of an accident involving concentrated acids.

Materials for *Holey Socks!* are available from Flinn Scientific, Inc.

Catalog No.	Description
S0228	Sulfuric Acid, 18 M, 100 mL
S0145	Sulfuric Acid, 18 M, 2.5 L
AP4560	Flinn ChemCam™ Camera

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