

Sulfuric Acid and Nylon

Start with Safety — Safety Demonstrations



Introduction

Talking about safety and reminding your students to wear their safety goggles can become repetitious and boring after a while. This demonstration will liven up your safety discussion and may make the point—wear your safety goggles!

Concepts

- Chemical safety
- Physical changes
- Eye safety
- Chemical changes
- Safety goggles

Materials

Acetone, CH_3COCH_3 , 50 mL	Marker, red
Sulfuric acid, H_2SO_4 , 6 M, 20 mL	Panty hose
Acetone wash bottle	Spray bottle
Chemical splash goggles	Styrofoam® wig head
Demonstration tray	

Safety Precautions

Sulfuric acid is corrosive to eyes, skin, and other body tissue. Acetone is flammable and slightly toxic by ingestion and inhalation. Wear chemical splash goggles, chemical-resistant gloves, and a chemical-resistant apron. Please consult current Material Safety Data Sheets for additional safety information.

Preparation

1. Draw a set of eyes on the Styrofoam wig head using a red marker.
2. Fill an aerosol spray bottle with 20 mL of 6 M sulfuric acid.
3. Fill an acetone wash bottle with acetone.

Procedure

1. Place a Styrofoam wig head on a chemical-resistant demonstration tray.
2. Place a pair of chemical splash goggles on the wig head.
3. Place a pair of panty hose over the wig head. Pull the panty hose down so it completely covers the head and the legs flop down like ears. (Yes, this will look very silly but you will probably have your student's undivided attention at this point.)
4. Explain to your class that strong acids are very corrosive and will cause severe damage to clothing, skin, eyes, and most other organic materials. Proper attire is required and safety goggles must be worn when working in the lab.
5. Carefully spray the nylon-clad wig head with 6 M sulfuric acid. The wig head will immediately start to decompose and disintegrate, leaving behind only the dyes from the panty hose.
6. When the panty hose has disintegrated, spray the front of the Styrofoam head with acetone. The head will start to dissolve.
7. Point out to your students that even though the acid and the acetone have thoroughly destroyed the panty hose and wig head, the eyes are protected and safe behind the sight-saving safety goggles!

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures governing the disposal of laboratory waste. The remains of the wig head and nylons may be disposed of in the trash according to Flinn Suggested Disposal Method #26a. Clean the demonstration tray and wipe up any excess acid or acetone from around the demo area.

Tips

- Styrofoam wig heads are available at costume or wig stores.
- Aerosol spray bottles are available from Flinn (AP4583). Other pump spray bottles may also work well.

Discussion

This demonstration is a good introduction to laboratory safety and the importance of wearing aprons and safety goggles. It can also be used as an introduction to physical and chemical changes—but this may be a stretch.

Nylon is a polyamide formed from the condensation reaction between an acid and an amine. One common type of nylon is made from adipic acid and hexamethylenediamine (Figure 1). The condensation reaction is reversible if water and an acid are present. When sulfuric acid is sprayed on the nylon, a chemical change occurs and the nylon is converted back to its monomers.

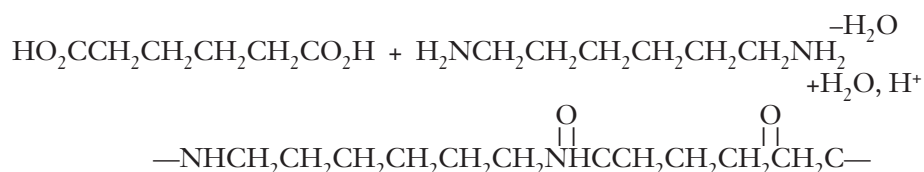


Figure 1.

Polystyrene is an addition polymer made from the polymerization of styrene (Figure 2). Polystyrene is not easily converted back to styrene monomer. One common form of polystyrene is foamed polystyrene, commonly called Styrofoam. Injecting a blowing agent, normally pentane or carbon dioxide, into molten polystyrene makes foamed polystyrene. As the polystyrene cools and begins to harden, the blowing agent leaves voids (air pockets) in the polymer. These voids have excellent insulating properties. Polystyrene dissolves in acetone, thereby releasing the blowing agent and losing its shape. This is only a physical change.

Flinn Scientific—Teaching Chemistry™ eLearning Video Series

A video of the *Sulfuric Acid and Nylon* activity, presented by Bob Lewis, is available in *Start with Safety—Safety Demonstrations*, part of the Flinn Scientific—Teaching Chemistry eLearning Video Series.

Materials for *Sulfuric Acid and Nylon* are available from Flinn Scientific, Inc.

Catalog No.	Description
S0415	Sulfuric Acid, 6 M, 500 mL
A0009	Acetone, 500 mL
AP4583	Aerosol Bottles
AP1669	Acetone Safety Wash Bottle

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