Mirror Glass

Fun with Polymers

Introduction

A little magic breaks the spell!

Concepts

- Polymers
- Superabsorbents
- Scientific method

Materials

Sodium polyacrylate, 0.5 g
Water, distilled or deionized, 100 mL
Food coloring
Coffee, cold (optional)
Mirror Glass
Silk, colored

Safety Precautions

Sodium polyacrylate is nontoxic. However, it is irritating to the eyes and also to nasal membranes if inhaled. Wear chemical splash goggles whenever working with chemicals, heat or glassware. Sodium polyacrylate is an obvious choice for student pranks. Be careful students do not have access to sodium polyacrylate outside of chemistry class. Please review current Material Safety Data Sheets for additional safety, handling, and disposal information.

Preparation

1. Obtain a mirror glass. Be sure the mirror insert is sealed to the glass using silicone sealer.
2. Place the colored silk on one side of the mirror insert.
3. Place a teaspoon of sodium polyacrylate at the bottom of the other side of the mirror insert.
4. Place colored water or cold coffee into a soda can.

Procedure

1. Hold the glass at the bottom and turned so the side with the sodium polyacrylate is toward the audience. Do not let the audience see the side with the silk.
2. Pour the colored water or cold coffee into the half of the glass with the sodium polyacrylate. Do not pour the liquid into the silk side of the glass.
3. Pause to make sure the liquid has solidified, then using your fingers as a pivot point (in line with the mirror insert), invert the glass. The glass should be upside down with the silk side toward the audience.
4. Pause to allow audience members a moment to think and then reach into the glass and pull out the silk.
5. Put the glass down and out of sight so the other half cannot be seen.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures governing the disposal of laboratory waste. Sodium polyacrylate and the gelled material can be disposed of in the trash according to Flinn Suggested Disposal Method #26a. Do not put sodium polyacrylate down the sink!

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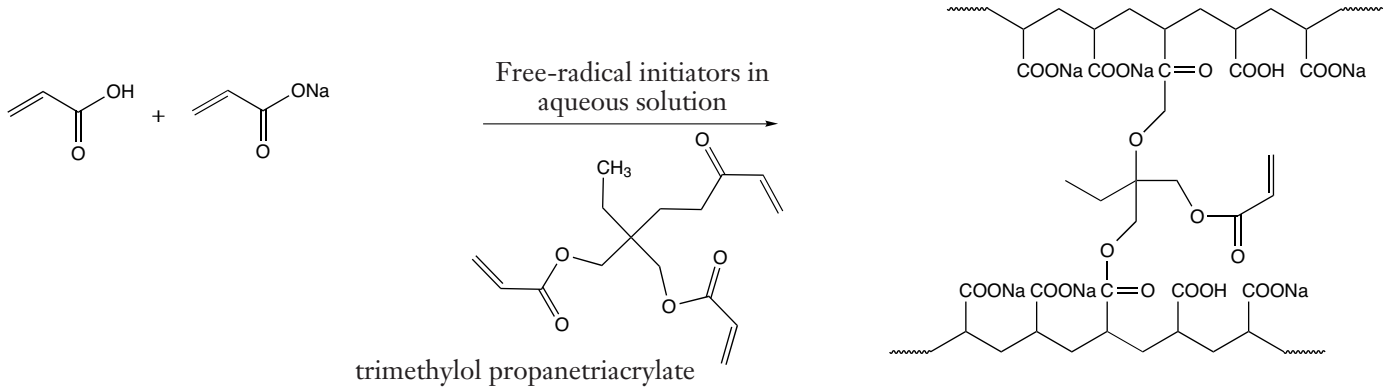
Tips

- Do not use soda pop as the carbonation interferes with the solidification process.
- A practical use of sodium polyarylate is found in disposable diapers. An extra demonstration can be performed to show how much water one of these diapers can hold.
- After you have discussed with students what really happened in the demonstration, gradually add granulated salt to the gelled polymer. The addition of sodium chloride will break the gel as water leaves the polymer to dilute the salt concentration outside the polymer network. The result will be the apparent "deflation" of the gelled polymer.
- Remember to add your own personal touches, practice makes perfect, and have fun!

Discussion

Sodium polyacrylate is an example of a superabsorbent polymer. Superabsorbents operate on the principle of osmosis—the passage of water through a membrane permeable only to the water. Here, osmotic pressure results from the difference in sodium ion concentration between the inside of the polymer and the solution in which it is immersed. This osmotic pressure forces water into the solid polymer lattice in an attempt to equilibrate sodium ion concentration inside and outside the polymer. The electrolyte concentration of the water will effect the osmotic pressure, subsequently affecting the amount of water absorbed by the polymer. For example, sodium polyacrylate will absorb approximately 800 times its own weight in distilled water, but will only absorb about 300 times its own weight in tap water, due to the high ion concentration of tap water. Sodium polyacrylate is manufactured by the free-radical polymerization of a mixture of sodium acrylate and acrylic acid, and a cross linker such as trimethylol propanetriacrylate

Sodium polyacrylate is the main ingredient in high-absorbency diapers. (It can absorb about 30 times its own weight in urine). It is also commonly used in alkaline batteries, feminine hygiene products, nursery potting soil, water beds, and as a fuel filtration material to remove moisture from automobile and jet fuels.



trimethylol propanetriacrylate

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
Form and function

Content Standards: Grades 9–12

Content Standard A: Science as Inquiry
Content Standard B: Physical Science, structure and properties of matter
Content Standard F: Science in Personal and Social Perspectives, science and technology in local, national, and global challenges

Flinn Scientific—Teaching Chemistry™ eLearning Video Series

A video of the *Mirror Glass* activity, presented by Jeff Hepburn, is available in *Fun with Polymers*, *Scientific Method Learning Activities* and in *Momentary Diversions*, part of the Flinn Scientific—Teaching Chemistry eLearning Video Series.

Materials for *Mirror Glass* are available from Flinn Scientific, Inc.

Catalog No.	Description
W0012	Sodium Polyacrylate, Powder, 25 g
W0013	Sodium Polyacrylate, Powder, 100 g
W0014	Sodium Polyacrylate, Powder, 500 g

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

Mirror Glass