

Silicone Super Ball



Introduction

Two solutions are mixed, forming a solid polymer that bounces when shaped into a ball.

Concepts

- Silicones
- Polymers

Materials

Ethyl alcohol, $\text{CH}_3\text{CH}_2\text{OH}$, 95%, 10 mL	Latex gloves
Sodium silicate solution, (water glass), 20 mL	Paper or plastic cup, small
Graduated cylinder, 25-mL	Wooden splint

Safety Precautions

Ethyl alcohol is a dangerous fire risk; it is flammable. The addition of denaturant makes ethyl alcohol toxic by ingestion. Sodium silicate solution is very alkaline; a skin irritant. 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. Measure out 20 mL of sodium silicate solution using the 25-mL graduated cylinder. Add the solution to the paper cup.
2. Measure out 10 mL of 95% ethyl alcohol and add it to the paper cup.
3. Stir the mixture with the wooden splint in a regular circular motion.
4. As the mixture solidifies, squeeze out the liquid with latex-gloved hands; place the solid in the palm of the hand and form the solid into a ball.
5. While forming the ball, continue to gently press out the excess liquid.
6. Bounce the ball!

Disposal

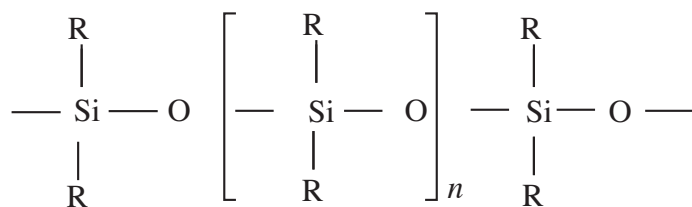
Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures governing the disposal of laboratory waste. The wood splint and excess product from the reaction may be disposed of according to Flinn Suggested Disposal Method #26a.

Tips

- Adjust the amount of alcohol used (anywhere from 5 to 15 mL) and observe the differences between the superballs. The balls will vary in how brittle they are.
- The silicone super ball is brittle and may crumble. It may be reformed by pressing it between the palms of the hands.
- The super ball should be stored in a closed or airtight container when not in use.

Discussion

The super ball is a variation of a simple silicone. Silicone is the term used to describe any organosilicon oxide polymer in which the structural unit is usually:



R is an organic, usually a methyl group.

Silicones are characterized by wide-range thermal stability, high lubricity, extreme water repellence, and physiochemical inertness.

Their wide-ranging uses include adhesives, lubricants, protective coatings, paints, electrical insulation, synthetic rubber, and prosthetic replacements for body parts, including implants.

Sodium silicate solution is produced by fusing sand (SiO_2)_n and soda ash (Na_2CO_3) in a furnace at about 1300 °C. The final product, $\text{Na}_2\text{O}(\text{SiO}_2)_n$ is also called water glass. The reaction with ethyl alcohol produces a super ball which is most likely a silicone elastomer where the R is ($-\text{O}-\text{CH}_2\text{CH}_3$).

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 5–8

Content Standard B: Physical Science, properties and changes of properties in matter

Content Standard E: Science and Technology

Content Standard F: Science in Personal and Social Perspectives; science and technology in society

Content Standard G: History and Nature of Science, science as a human endeavor, nature of science, history of science

Content Standards: Grades 9–12

Content Standard B: Physical Science, structure of atoms, structure and properties of matter, chemical reactions

Content Standard E: Science and Technology

Content Standard F: Science in Personal and Social Perspectives, science and technology in local, national, and global challenges

Reference

Gardner, M.; Summerlin, L.; Borgford, C. *Selected Demonstrations from Berkeley I.C.E.*, Summer, 1985.

Materials for *Silicone Super Ball* are available from Flinn Scientific, Inc.

Catalog No.	Description
S0102	Sodium Silicate Solution, 500 mL
E0009	Ethyl Alcohol, 95%, 500 mL
AP4444	Wood Splints, pkg./100

Consult the [Flinn Scientific website](#) for current prices.