

Silly Putty

Summary

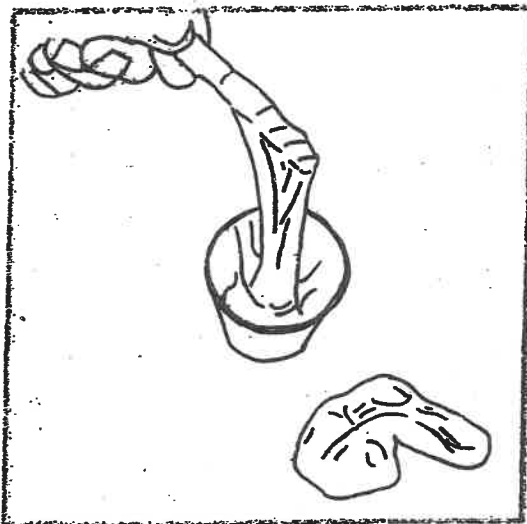
Make silly putty. Understand the chemical reaction that makes it and the chemistry of its behaviour.

New Chemistry Curriculum links

Properties of Materials (gr. K, 1, 3), Chemical Processes (gr. 2, 7), Atoms, Molecules, Elements and Compounds (gr. 3, 7), Solutions and Solubility (gr. 5)

Curricular Competencies

Observation, manipulation, questioning, measuring, interpreting data, inferring, concluding.



Materials

- white glue, 1 Tablespoon per student
- water
- container to hold white glue mixture, about 4 cups
- borax, ~1/16 teaspoon per student
- heat-proof container to hold borax solution, about 2 cups
- Tablespoon, teaspoon, and cup measures
- Dixie cups, 2 per student
- stir sticks
- baggies, one per student

Materials Cost

\$5 for the white glue, \$6 for a box of borax (or get the couple of teaspoons you need donated), several dollars for Dixie cups, stir sticks and baggies from the dollar store,

Procedure

Make a large class batch of each ingredient:

Make 1:1 white glue:water, enough for 2 Tablespoons per student. (There are 16 Tablespoons in a cup.)

Mix 2 teaspoons borax into 2 cups water. It may need heating to help dissolve the borax completely.

Give each student 2 Tablespoons white glue:water mixture in a Dixie cup.

Give each student 1 Tablespoon of the borax solution in another Dixie cup.

Ask the students to pour the borax into the white glue, and immediately stir with the stir stick until they are combined. It will thicken up quickly as a chemical reaction makes the silly putty.

Students can spend some time playing with the silly putty and exploring its properties. They should find that if it is moved slowly, it can flow, but when it is suddenly pulled it breaks.

Explain the chemical reaction that makes the silly putty:

The white glue contains long flexible molecules made up of repeating units (called polymers). When borax is added, it makes permanent (covalent) bonds between some of the units of adjacent glue polymer molecules, called cross-links. The cross-linking results in a branching web of long glue molecules, giving the silly putty its thick texture.

Explain the chemistry of how silly putty behaves:

There are other bonds between the silly putty molecules (called hydrogen bonds), which are weaker bonds and can easily break and reform. When the silly putty is pulled slowly, some hydrogen molecules break, but then reform with another adjacent polymer. As these hydrogen bonds continually break and reform, the silly putty stays in one piece but can flow and change shape. However, when silly putty is pulled on suddenly, many hydrogen bonds are broken at once, so the silly putty breaks apart. The pieces can be reattached by holding them together until the hydrogen bonds reform.

More details, references and further experiments

- This activity as well as another recipe for a stiffer silly putty (with more cross-linking) at www.ingridscience.ca/node/482

Name _____

Silly Putty



Materials white glue, water, container, borax, Dixie cups, stir stick, baggies

Procedure What we did.

We mixed white glue and water
with borax and water.
We stirred the mixture.

Observation What we saw and learned.

We saw the mixture become
thicker.

Summary

A chemical reaction
changed the liquids to Silly
Putty.