



► **School Lessons with Pritt**

These materials are part of the Researchers' World education initiative. The teaching concept and program were developed under the guidance of Prof. Dr. Katrin Sommer, Chair of Chemistry Didactics at Ruhr University Bochum, Germany, with the support of Henkel adhesive experts. The experiment is suitable for third or fourth grade students.

► **Lesson 5: Making a starch paste**

In the preliminary experiments, the students discovered that mixing starch with cold water produces a sticky substance. However, this substance is not yet suitable for use as an adhesive. Something else needs to happen to the mixture beforehand.

Materials needed

- Starch obtained by the students or commercial cornstarch
- 1-2 fire-resistant glass jars or cooking pans
- Hotplate, two-ring stove or oven
- 1-2 glass rods or spoons for stirring
- 1 thermometer

Part 1: Discussion

The first task is to compile suggestions about what could be done to make the starch and water mixture stickier. The students' experiences of cooking and baking, such as making cake glaze, could provide a starting point. Once the students have come up with appropriate suggestions, the instructions for making starch paste can be introduced. The students make it using the starch they obtained and use it to stick the experiment instructions into their notebooks.



Part 2: Comparing glue sticks with starch paste

To make the starch paste, 1 g ($\frac{1}{4}$ teaspoon) of the starch obtained by the students is mixed with 5 ml (1 teaspoon) of water and heated at about 80°C (175°F) on a hotplate until the mixture begins to stick to the rod or spoon. The starch swells when it is heated. This swelling is caused by the solvent (water) being bound by capillary action and then evaporating. Examples from everyday life include making pudding and thickening sauces. If insufficient starch was obtained during the starch extraction, a little cornstarch may be added.

When the students compare the properties of their starch paste with those of the glue stick substance, they discover both similarities and differences. For instance, the homemade paste has a consistency like honey whereas the glue stick substance is solid. In addition, when the glue stick substance is dissolved in water (assisted by shaking), a particular phenomenon occurs: The mixture foams. This is a phenomenon with which the students are familiar from washing their hands with soap.

As a comparison, the students need to dissolve their starch paste in water and shake it. The glue stick substance does indeed contain a small proportion of soap to improve abrasion resistance. Odor: There are also significant differences between the two substances in terms of odor. The starch paste has a similar smell to cooked pasta, while the glue stick is fragranced and smells artificial.

The next step is to repeat the production of the starch paste, but this time adding soap shavings. This is the focus of the next class.



► Worksheets for students

► Lesson 5: Making a starch paste

After you have learned how to obtain starch from food, you can produce a starch paste.

1. Put 1 g ($\frac{1}{4}$ teaspoon) of starch and 5 ml (1 teaspoon) of water into a 50 ml (1.7 fl. oz.) beaker and mix together well with a glass rod.
2. Heat the resulting mixture on a hotplate to about 75°C (167°F) until it begins to stick to the glass rod.
3. Test the starch paste by using it to glue two sheets of paper together

Investigate the properties of the starch paste you made and the properties of the adhesive substance in a glue stick.

Name the properties that you would like to investigate and enter them in the table. Carry out your investigation. Which properties do the substances have in common and what are the differences? Enter your observations in the table.

1. Put a spatula tip of starch paste into a test tube, add 5 ml (1 teaspoon) of water and seal the test tube with a stopper.
2. Shake the test tube for about 30 seconds.
3. Repeat the process with the substance from the glue stick.
4. Enter these observations in the table too.

Property	Observations Glue stick	Observations Starch paste