Creating Clay for Testing

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Topic

Physical change vs. chemical change, mixtures vs. compounds

Time

30 minutes for main body of experiment, several days for final observation

Safety

Please click on the safety icon to view the safety precautions. Iodine is poisonous. Do not put it into or near your mouth or eyes. It may stain clothes or skin, so wear an apron. Do not eat or throw the clay.

Materials

one small cooking pot
flour
measuring spoons (teaspoon, ¼ tsp, ¼ tbs)
salt
cooking oil
measuring cup
water
stove or hot plate
tincture of iodine
apron
aluminum foil
potholder
ink marker
stirring spoons
hand-held magnifying lens
two eyedroppers
paper towels
cream of tartar
facial tissue

Procedure

1. Tear off 12 in. of foil.
2. Using an ink marker, draw a test sheet, like the one shown below, on the foil.

TEST SHEET						
Item	Flour	Cream of tartar	Salt	Water	Oil	Clay
Hand lens						
Add iodine						
Add water						

3. Make another copy of the test sheet on a plain sheet of paper. This will be your data table for recording your observations. Label it "data table."
4. Place ¼ tsp of flour in the first box on the foil test sheet. Then clean the spoon with a paper towel. (Note: It is very important to clean the spoon between each sample to avoid contamination.) Now place ¼ tsp of cream of tartar in the second box, and clean the spoon. Continue this process until you have placed samples of each material listed on the test sheet, except the clay, in the first row on the foil.
5. Examine the texture of each substance with a magnifying glass, and record your result on the data table. Is the substance crystalline, granular, powdery, clear?
6. Gather the following materials for making the clay and place them in the small pot:

   1 cup flour
   1 cup salt
   2 tsp cream of tartar
   2 tbs cooking oil
   ¾ cup water

   Do Not Stir Yet!
7. Observe the materials as you begin to mix them with a spoon (color, texture, etc.) Do they dissolve?
8. Cook and stir the ingredients over medium heat for about 3 min or until the clay thickens and does not stick to the pot. Do not overcook.
9. Turn off the heat and remove the pot from the burner. Remove the clay to a table surface, and knead it until it is cool. Break off a small piece and place it in the last box of the first line of your foil test sheet. Examine its texture, and record your results on the first line of your data table. Press the clay onto a piece of facial tissue, and record your results on the first line of your data table.
10. Now place ¼ tsp of each material on the second row of the foil test sheet. Using an eyedropper, add a small drop of iodine to each of the materials, and observe any changes in the color of the iodine. (Iodine is used in this experiment as an indicator for starch.) Record your observations.
11. Place ¼ tsp of each material on the third row of the foil. Using the second dropper, add 1 drop of water to each of these samples. Observe any color changes as you add water to the samples. Record your observations.
12. Compare the appearance of the combined material used to make the clay with the cooked clay.
13. What materials could you see when you examined the clay with the magnifying glass?
14. What did you discover when you felt the newly made clay and pressed it on the tissue?
15. What did the color changes in the iodine indicate about the substances?
16. Why did you test all ingredients with water?
17. Is clay a mixture or a compound?

What's Going On

Although the clay does not have the same texture as its components, it is a mixture rather than a compound. Using various means, you were able to test for most of the

specific ingredients in the clay. An examination of the clay with a magnifying glass revealed salt crystals in the mixture. Blotting the clay with tissue revealed the presence of oil; the moisture you felt revealed the presence of water.

The iodine changed color only in the presence of the flour and the clay. Since iodine is an indicator for starch, this test proved that flour, which is a starch, is present in the clay. The water was used as a control to prove that it was the chemical properties of the iodine and not its liquidity that caused the color change.

Connections

A *physical change* is a change in matter in which the individual molecules of the substance(s) involved are not changed. Water freezing into ice is an example of a physical change. Although the substance has changed from a liquid to a solid, each individual molecule is still the same as it was before the change. The change can easily be reversed by allowing the ice to melt back into water.

A *chemical change* is a change in matter in which the molecules of the substance(s) undergo a transformation into a different kind of molecule. Metal rusting is an example of a chemical change. Some of the molecules of the metal have changed into entirely different chemical substances and cannot be reversed to the original substance. A combination of substances resulting from a physical change is called a *mixture*. A combination of substances resulting from a chemical change is called a *compound*. In this experiment you made clay and differentiated between the two types of change. Clay is a mixture.

Safety Precautions

READ AND COPY BEFORE STARTING ANY EXPERIMENT

Experimental science can be dangerous. Events can happen very quickly while you are performing an experiment. Things can spill, break, even catch fire. Basic safety procedures help prevent serious accidents. Be sure to follow additional safety precautions and adult supervision requirements for each experiment. If you are working in a lab or in the field, do not work alone.

This book assumes that you will read the safety precautions that follow, as well as those at the start of each experiment you perform, and that you will *remember* them. These precautions will not always be repeated in the instructions for the procedures. It is up to you to use good judgment and pay attention when performing potentially dangerous procedures. Just because the book does not always say "be careful with hot liquids" or "don't cut yourself with the knife" does not mean that you should be careless when simmering water or stripping an electrical wire. It *does* mean that when you see a special note to be careful, it is extremely important that you pay attention to it. If you ever have a question about whether a procedure or material is dangerous, stop to find out for sure that it is safe before continuing the experiment. To avoid accidents, always pay close attention to your work, take your time, and practice the general safety procedures listed below.

PREPARE

- Clear all surfaces before beginning work.
- Read through the whole experiment before you start.
- Identify hazardous procedures and anticipate dangers.

PROTECT YOURSELF

- Follow all directions step by step; do only one procedure at a time.
- Locate exits, fire blanket and extinguisher, master gas and electricity shut-offs, eyewash, and first-aid kit.
- Make sure that there is adequate ventilation.
- Do not horseplay.
- Wear an apron and goggles.
- Do not wear contact lenses, open shoes, and loose clothing; do not wear your hair loose.
- Keep floor and work space neat, clean, and dry.
- Clean up spills immediately.
- Never eat, drink, or smoke in the laboratory or near the work space.
- Do not taste any substances tested unless expressly permitted to do so by a science teacher in charge.

USE EQUIPMENT WITH CARE

- Set up apparatus far from the edge of the desk.
- Use knives and other sharp or pointed instruments with caution; always cut away from yourself and others.
- Pull plugs, not cords, when inserting and removing electrical plugs.
- Don't use your mouth to pipette; use a suction bulb.
- Clean glassware before and after use.
- Check glassware for scratches, cracks, and sharp edges.
- Clean up broken glassware immediately.

- Do not use reflected sunlight to illuminate your microscope.
- Do not touch metal conductors.
- Use only low-voltage and low-current materials.
- Be careful when using stepstools, chairs, and ladders.

USING CHEMICALS

- Never taste or inhale chemicals.
- Label all bottles and apparatus containing chemicals.
- Read all labels carefully.
- Avoid chemical contact with skin and eyes (wear goggles, apron, and gloves).
- Do not touch chemical solutions.
- Wash hands before and after using solutions.
- Wipe up spills thoroughly.

HEATING INSTRUCTIONS

- Use goggles, apron, and gloves when boiling liquids.
- Keep your face away from test tubes and beakers.
- Never leave heating apparatus unattended.
- Use safety tongs and heat-resistant mittens.
- Turn off hot plates, bunsen burners, and gas when you are done.
- Keep flammable substances away from heat.
- Have a fire extinguisher on hand.

WORKING WITH MICROORGANISMS

- Assume that all microorganisms are infectious; handle them with care.
- Sterilize all equipment being used to handle microorganisms.

GOING ON FIELD TRIPS

- Do not go on a field trip by yourself.
- Tell a responsible adult where you are going, and maintain that route.
- Know the area and its potential hazards, such as poisonous plants, deep water, and rapids.
- Dress for terrain and weather conditions (prepare for exposure to sun as well as to cold).
- Bring along a first-aid kit.
- Do not drink water or eat plants found in the wild.
- Use the buddy system; do not experiment outdoors alone.

FINISHING UP

- Thoroughly clean your work area and glassware.
- Be careful not to return chemicals or contaminated reagents to the wrong containers.
- Don't dispose of materials in the sink unless instructed to do so.
- Wash your hands thoroughly.
- Clean up all residue, and containerize it for proper disposal.
- Dispose of all chemicals according to local, state, and federal laws.

BE SAFETY-CONSCIOUS AT ALL TIMES