

Activity 2.4

Recrystallization test

Can you identify the unknown crystal by the way it looks when it recrystallizes?

The way a substance dissolves in water is a *characteristic property* of that substance. Similarly, the way a substance “un-dissolves”, or *recrystallizes*, is also a characteristic property of the substance. The following recrystallization tests provide another clue that can help confirm the identity of the unknown. In this activity, students will allow each sample of crystal solution made in *Activity 2.3* to recrystallize. The crystals that form appear different enough that students will be able to positively identify the unknown. Two different methods for recrystallization are provided in this activity.

24-Hour method

The 24-hour method may be preferable since the solutions are left overnight to recrystallize and show clear differences when students view them the next day.

Same-day method

If you need results within 1–3 hours, you may want to try the same-day method. Since the testing surface will be paper and characteristics of paper vary, this test is not as reliable as the 24-hour method. The absorbency of the papers affects the quality of the crystals and the ability to observe them on the surface of the paper. Test one sheet of paper according to the instructions on p. 103 before trying this method with your students.

Materials needed for each group

24-Hour method

5 Labeled clear plastic cups
from *Activity 2.3*
Crystal solutions from *Activity 2.3*

Same-day method

Crystal solutions from *Activity 2.3*
Permanent marker
Cotton swabs

Notes about the materials

- **Be sure you and the students wear properly fitting goggles.**
- *Activity 2.4—Recrystallizing test* should be done immediately after *Activity 2.3—Solubility test* using the crystal solutions made during the activity.

Activity sheet



Copy either *Activity sheet 2.4—Recrystallization test, 24-hour method*, pp. 104–105, or *Activity sheet 2.4—Recrystallization test, same-day method*, pp. 106–107, and distribute one per student when specified in the activity.

Assessment

An assessment rubric for evaluating student progress during this activity is on pp. 108–109. For this formative assessment, check a box beside each aspect of the activity to indicate the level of student progress. Evaluate overall progress for the activity by circling either “Good”, “Satisfactory”, or “Needs Improvement”.

Activity 2.4

Recrystallization test

Question to investigate

Can you identify the unknown crystal by the way it looks when it recrystallizes?

24-Hour method

1. Students will reuse the large clear plastic cups and solutions from *Activity 2.3* according to the procedure below.

Procedure

1. Rinse each large clear plastic cup with water to remove any remaining crystal. Dry each with a paper towel.
2. Carefully pour the solution from each small cup into its corresponding large clear plastic cup.
3. Allow the solutions to sit overnight.



2. The next day, have students observe the crystals.



Distribute *Activity sheet 2.4—Recrystallization test*, p. 104–105. You may want to have students use a magnifying glass so that they can better see details of the crystals. Have students observe the crystals from the top and bottom of the cup and describe what they see in each cup.

***Expected results:* Salt and the unknown look very similar. Epsom salt, MSG, and sugar look different from each other and different from salt and the unknown. The sugar may not have recrystallized yet, but given more time it will form large clear crystals.**

When students have completed the activity sheet, ask them questions like the following:

- What do you think is the identity of the unknown?
- Do you have enough information to be sure?

Students should be able to determine that the identity of the unknown is salt. Tell students that the unknown is coarse kosher salt. It is chemically the same as regular salt, but the process for making each is different and that is why they look different.

Same-day method

1. Have students apply the solutions to the activity sheet.



Distribute *Activity sheet 2.4—Recrystallization test*, pp 106-107. Tell students that they will apply some of each solution to the circles on the activity sheet. When the water evaporates, crystals will re-form.

Procedure

1. Although the circles are already black, use a black permanent marker to completely cover each circle with a layer of marker.
2. Dip a cotton swab into one of the solutions. Apply the solution in a circular motion to its labeled area on the activity sheet. Repeat until as much of the circle is covered with the solution as possible.
3. Using clean cotton swabs, repeat Step 2 for the other four solutions. Set the paper aside and check it in about an hour. If not much crystal has formed; check it again in another hour.
4. Compare the unknown to the other crystals.



2. Have students discuss their observations.

Students can use a magnifying glass to better see details of the crystals. Ask students what they see on each circle.

Expected results: Salt and the unknown look very similar. Epsom salt, MSG, and sugar look different from each other and different from salt and the unknown. The sugar may not have recrystallized yet.

When students have completed the activity sheet, ask them questions like the following:

- What do you think is the identity of the unknown?
- Do you have enough information to be sure?

Students should be able to determine that the identity of the unknown is salt. Tell students that the unknown is coarse kosher salt. It is chemically the same as regular salt, but the process for making each is different and that is why they look different.