

## Supersaturation

### Purpose

To demonstrate crystal growth from a supersaturated solution of sodium acetate.

### Materials

|                         |                           |
|-------------------------|---------------------------|
| heating unit            | sodium acetate trihydrate |
| 500 mL Erlenmeyer flask | crystallizing dish        |
| 100 mL beaker           |                           |

### Procedure

1. Prepare a water bath with a one liter beaker.
2. Measure out 175 grams of  $\text{NaC}_2\text{H}_3\text{O}_2 \bullet 3\text{H}_2\text{O}$ .
3. Place it in a **CLEAN** 500 mL Erlenmeyer flask, taking care to limit the amount of the sodium acetate trihydrate that comes in contact with the side of the flask.
4. Add 50 mL of distilled water to the flask, using the water to rinse off any residual solid that may be on the side of the flask.
5. Heat the flask in the boiling water bath, swirling the flask occasionally **without getting any of the solution splashed up on the side of the flask** until a clear, homogeneous solution is obtained.
6. After removing the flask from the heat source, place it in a safe area on paper towels, invert a 100 mL beaker over the mouth of the flask and allow the solution to cool until it reaches room temperature (1-3 hours).

**\*Be careful not to jar the solution or it will “crash out”.**

7. Firmly cover the solution with parafilm until needed.
8. Drop 1 or 2 crystals of sodium acetate on a crystallizing dish. Slowly pour the solution onto the crystals. Crystallization will occur immediately, forming a mound of solid sodium acetate.

### Additional Information

1. If the solution is not cool enough, the solid will not effectively form.
2. It is a good idea to make two batches of the solution, in case one of the batches crashes out. If they both work, they can be used to make a larger mound.
3. In some cases it is best to purchase a new flask to ensure it is properly clean.
4. After the demonstration, the solid can be cut up with a spatula and returned to the flask. The supersaturated solution is restored by heating in a boiling water bath. The mixture can be used again if not contaminated. Small amounts of water may have to be added to compensate for evaporation losses.

5. A variation on a small scale involves placing the supersaturated solution in a large test tube with an accompanying thermometer. Add 1 or 2 crystals to the test tube and observe the feathery crystals form. Illumination from below makes the phenomenon more easily visible. Note that the temperature will increase.
6. Have a sample of a Heat Solution hot pack available to show a practical application of this concept.

### **Question for the Students**

1. What causes the solution to crystallize?

### **Disposal**

The solid can be thrown away in the trash and any remaining solution can be washed down the drain with excess water.

### **Reference**

Shakharshiri, Bassam, Chemical Demonstrations, Volume I, 1983