



Heating and Cooling Curves

Topical Unit of Instruction: Liquids and Solids

Introduction

This lab uses lauric acid, a non-toxic chemical, as a substitute for the commonly used para-dichlorobenzene, which is toxic as well as a possible carcinogen. The lauric acid can be saved and reused from year to year.

Time

50 minutes for data collection

30 minutes for graphing

Objectives

1. To generate heating and cooling curves for a pure substance.
2. To determine the freezing/melting point of lauric acid from the cooling/heating curves.

Preparation

1. Pre-measure the lauric acid in test tubes and Parafilm® until ready to use. It is wise to set up an extra test tube just in case students accidentally stir through the bottom of a test tube with the thermometer.
2. Using a piece of laboratory tape, label 16 thermometers with letter or number codes for use in the lauric acid. If you are planning to have students do the freezing point depression lab using the benzoic acid/lauric acid solution, each pair must use the same thermometer they used in the pure lauric acid.

Safety Reminders

1. Students need to stir the melted lauric acid with the thermometers very carefully, or they will stir the bottoms out of the test tubes.
2. Students need to be reminded not to touch anything hot with their skin.

Typical Results

Graphs usually produce obvious plateaus at about 41- 44° C. Accepted melting point is 44° C.

Disposal

Test tubes can be Parafilmed® and reused indefinitely.

Hint

This lab could easily be adapted to computer or graphing calculator temperature probes.

Materials

(For a class of 32 students working in pairs)

- 16 large test tubes (25 x 150 mm work well) each containing 15 g lauric acid
- 16 test tube holders
- 32 large (400-600 mL) beakers
- 16 hot plates (8 will do if 2 pairs share)
- 32 thermometers
- clock (or watches) with second hand
- 32 sheets of graph paper

