

PARTIAL THERMAL DEGRADATION OF A MIXED SACCHARIDES TRIOL SOLUTION

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MATERIALS NEEDED

Apparatus:

NOTE: This procedure uses special glassware. Do not use any apparatus from your laboratory locker unless specifically instructed to do so.

- 250 mL beaker or paper or plastic cup, 6 to 9 ounces
- 600-mL beaker
- thermometer, 250°C or greater range
- 10-mL graduated cylinder or measuring spoons
- 100-mL graduated cylinder or measuring cups
- balance or measuring cups
- aluminum foil
- waxed paper
- beaker tongs
- Hot plate OR Bunsen burners and ring supports with wire gauze

Chemicals:

- sucrose crystals
- 3 M glucose
- solidified mixed esters
- glycerin
- 4-hydroxy-3-methoxybenzaldehyde
- sodium chloride
- theobromine powder
- menthol/menthone solution
- limonene/monoterpene solution
- food color

SAFETY PRECAUTIONS

Wear safety goggles or glasses at all times in the laboratory.

All labware used in this experiment must be clean and free from laboratory chemicals. Special apparatus, reserved specifically for this experiment will be provided.

CAUTION: Materials in this experiment will be very hot. Handle hot beakers with beaker tongs. Allow hot plates to cool to room temperature before handling them.

DISPOSAL

There are no disposal problems with materials in this experiment.

EXPERIMENTAL PROCEDURE

Work in groups of 2 persons.

Using soap and water, wash all the glassware that is to be used in this experiment. Also, wipe down the bench top where you are working with a soap solution, wipe clean, and dry with paper towels. This cleaning is extremely important as dirt will interfere with the results of this experiment.

It is recommended that the bench top be covered with aluminum foil.

Weigh 97 g (1/2 cup) of sucrose, 0.75 g sodium chloride (1/8 tsp), 0.8 g (1/8 tsp) glycerin, and 78 g (1/4 cup) glucose solution into a 250-mL beaker or similar size cup (6 to 9 ounce cup). Transfer the mixture to a 600-mL beaker. Rinse the 250-mL beaker (or cup) with 45 mL water (3 tbs) and add the water to the mixture in the 600-mL beaker.

Heat the mixture on a hot plate (or with a burner), stirring constantly until the mixture reaches a temperature of 130°C.

While the heating is going on, one member of the group should obtain a piece of aluminum foil about 30 cm square (one foot square) and lightly coat it with some solidified mixed esters. Then, obtain 7 g (1/2 tbs) of solidified mixed esters, and ONE of the following:

- 1.25 mL (1/4 tsp) 4-hydroxy-3-methoxy-benzaldehyde
- 1.25 mL (1/4 tsp) 4-hydroxy-3-methoxy-benzaldehyde and 3 g (1/2 tsp) of theobromine (keep these separate)
- 1.25 mL (1/4 tsp) menthol/menthone solution
- 1.25 mL (1/4 tsp) limonene/monoterpene solution

When the temperature reaches 110°C, the mixture usually starts to foam. This problem can quickly be solved by quickly stirring the top layers, or by leaving the mixture alone, however, the same action will not work every time.

The mixture should start to thicken at 125°C. At this point, stirring may become difficult and it is handy to have one member of the group use beaker tongs to hold the beaker while stirring.

When the mixture reaches 130°C, remove it from the heat and allow it to stand for 2 to 3 minutes.

Stir in the solidified mixed esters and *either* the 4-hydroxy-3-methoxy-benzaldehyde, the menthol/menthone solution, or the limonene/monoterpene solution. If desired, a small amount of food color can be added at this time. Remove the mixture from the beaker onto the aluminum foil sheet coated with solidified mixed esters.

If you have measured the theobromine, you may dust the mixture with the theobromine powder.

As the mixture cools, fold the edges of the mixture into the center to keep them from becoming too hard.

When the mixture is cool enough to handle, put some solidified mixed esters on the fingers, pick up the mixture, and gently pull and stretch it. As it becomes thin, fold it in half, and continue to pull, stretch and twist it. Continue until the mixture becomes elastic and springs back on gentle pulling. Also, parallel ridges form on the surface of the mixture. (Note: If you added theobromine, the mixture should be uniform in color.)

Stretch the mixture into a rope and using a knife or scissors, cut it into pieces 2.5 cm (1 inch) long. Wrap the individual pieces with waxed paper. The product can be taken home.

Glassware and work areas can be cleaned with warm soapy water after completion of the experiment.

Please return all apparatus to the designated location as indicated by your instructor.