STUDENT ACTIVITY GUIDE

Effect of Emulsifiers on Process Cheese

Cheese is one of the oldest manufactured foods known to man. It represents a satisfactory method of preserving much of the nutrient content of milk. Our ancestors, lacking refrigeration, probably took advantage of the fact that cheese spoils less readily than milk. Process cheese is made from a blend of cheeses and added chemicals called *emulsifiers* which keep the fat from separating from the solids. This sometimes has advantages over regular cheese. One of these advantages is that the cheese can be heated to pasteurize it, making it less susceptable to spoilage. Process cheese may be manufactured to have specific melting properties to meet certain requirements, such as use in a cheeseburger. It also has a smoother texture, is less likely to crumble, and can be produced with more uniform flavor from batch to batch.

In this experiment, you will investigate the use of emulsifiers in making process cheese and their effects on the melting properties of cheese.

MATERIALS REQUIRED

Medium Cheddar cheese
Sodium phosphate dibasic (Na_2HPO_4)
Blender, or a cheese grater and bowl
Bunsen burner
Double boiler (or two beakers—one 500 mL, the other 250 mL)
Glass stirring rod
Thermometer
Cheese molds (paper hot cups or Popsicle molds)
Cork borer (or apple corer)
Knife
Cookie sheet
Oven

EXPERIMENTAL PROCEDURE

1. Your instructor will provide you with about 500 g of medium Cheddar cheese.

2. Cut the cheese into small pieces (about 1-cm cubes) and grind them in the blender at low speed. If you don't have a blender, grate the cheese into a bowl. Divide the ground or grated cheese into five batches of approximately 100 g each.

3. To four batches, add 0.5 g, 1 g, 2 g, and 4 g of sodium phosphate, respectively. This will make

the percentage of sodium phosphate in each of the samples approximately 0.5%, 1%, 2%, and 4%, respectively.

4. Heat the untreated batch of cheese in the double boiler to 150°F. If you don't have a double boiler, ask your teacher to show you how to rig a double boiler arrangement with the beakers. Stir the samples with a glass stirring rod, **not** with a glass thermometer. When the batch is melted, pour it into a mold and set it aside to cool.

5. Repeat the process with each of the four treated batches. Stir well during melting to make sure the sodium phosphate is well mixed into the batch. Also be sure to clean the cooking pan or beaker after each batch.

6. Remove each batch from the molds. Using the cork borer or apple corer, cut a cylindrical sample from the middle of each batch. Observe and record any differences in the appearance of the interior of the process cheese samples.

7. Trim each sample cylinder to about 2 cm high. Set the five samples on end on a cookie sheet and place them in a moderate oven (about 350°F) . Examine them periodically (about every minute) and note the differences in melting characteristics—speed of melting and appearance after melting. The total time in the oven should be 10–15 minutes.

8. Note the texture and melting characteristics in the table provided.

Caution: Unless the sodium phosphate is of food quality, do **not** taste the process cheese samples.

QUESTIONS

1. What is the purpose of using sodium phosphate in process cheese?

2. Which of the reheated cheeses melted quickest?

3. Which of the cheese samples melted with no curd showing? Which with the most?

4. Which level of Na_2HPO_4 would be the best to use in making process cheese?

DATA TABLE

Texture and Melting Characteristics

Amount of sodium phosphate	During heating	After coring	During reheating
None (control sample)			
0.5%			
1%			
2%			
4%			