Experiment: Popcorn - Water in a Mixture

SAFETY ALERT: DO NOT EAT YOUR PRODUCT.

Purpose To determine the percentage-by-mass water in popcorn.

Percentage-by-Mass - (Sometimes called parts per hundred).The number of grams of a part in 100 grams of the whole. The percentage-by-mass of a component is determined by dividing the mass of a component by the mass of the whole and multiplying by 100.

Discussion:

Foods are composed of carbohydrates, fats and proteins along with small amounts of vitamins, minerals and variable amounts of water. Popcorn kernels are corn seeds consisting of these compounds encased in a hard shell. The main component of the mixture is the carbohydrate called starch. Starch is in the form of granules that are impregnated with water. This experiment is designed to find the percentage-by-mass water in popcorn kernels.

Within a kernel of popcorn a small amount of water is intimately distributed throughout the starch granules. When a kernel is heated, the temperature of the water rises. As the temperature exceeds 100 °C. the water boils and turns to steam. A kernel which does not pop (a "dud") often has a crack or leak in the shell so that the steam escapes without expanding the starch.

To determine the percentage-by-mass of water in popcorn, the kernels are popped. First, a sample of kernels is weighed. The sample is heated to pop the kernels. The popped corn is then weighed. The mass of water driven off can be found by subtracting the mass of the popped corn from the mass of the unpopped corn. The percentage of water is found by dividing the mass of water by the mass of the sample of unpopped kernels and multiplying by 100.

Laboratory Procedure

Weigh a 50-mL beaker. Obtain 20 kernels of unpopped corn and place the kernels in the weighed beaker. Weigh the beaker with the 20 kernels. Pour these kernels into a hot air popper. REPEAT THIS PROCESS TWO MORE TIMES WITH DIFFERENT KERNELS. When the class has added all their kernels to the hot air popper, the popcorn will be popped.

Weigh a 250-mL beaker. Count out 20 kernels of POPPED corn and place into the weighed beaker. Weigh the beaker with the 20 kernels of POPPED corn. REPEAT THIS PROCESS TWO MORE TIMES WITH DIFFERENT POPPED KERNELS.

Calculate the average weight of an unpopped kernel and the average weight of a popped kernel. The average mass of water driven off from the 20 kernels of popped corn can be found by subtraction of these averages. Use the data to calculate the average percentage -by- mass of the water in the popcorn by dividing the mass of the water by the mass of the unpopped kernals and multiplying by 100.

Bellevue College CHEM& 121

POPCORN REPORT SHEET

Your Name_____ Lab Partner _____Lab Section_____

	TRIAL #1	TRIAL #2	TRIAL #3	AVERAGE
Mass of 50-mL beaker	_____	_____	_____	
Mass of 50-mL beaker and 20 kernels of UNPOPPED corn	_____	_____	_____	
Mass of 20 kernels of UNPOPPED corn	_____	_____	_____	_____
Mass of 250-mL beaker	_____	_____	_____	
Mass of 250-mL beaker and 20 kernels of POPPED corn	_____	_____	_____	
Mass of 20 kernels of POPPED corn	_____	_____	_____	_____
Average mass of water in 20 kernels				_____
Average percentage-by-mass water in popcorn				_____

1. Why does unpopped popcorn pop when heated?

2 Find the average mass of one kernel of unpopped popcorn.

Using this answer, calculate the number of kernels in a one pound jar of popcorn.

3. Using the data for the grams of water obtained in your experiment, calculate the number of grams of water per kernel of popcorn.

4. Determine the number of grams of water that is contained in 1.0 pound of unpopped corn.