



Parameter and Sample Type

Sodium in Potato Chips by Double Known Addition

Introduction

Sodium in Potato Chips is measured using the Double Known Addition (DKA) method on the Orion DUAL STAR™ Meter using the Orion 8611BNWP ROSS® Sodium combination electrode. DKA technique calculates the electrode slope and sodium concentration simultaneously. The electrode slope is determined directly in the sample, which results in greater accuracy for samples with complex matrices.

Reference

1. ROSS Sodium Ion Selective Electrode User Guide, www.thermoscientific.com/water

Recommended Equipment

Orion DUAL STAR™ Meter (Orion 2115000); Orion ROSS Sodium combination electrode (Orion 8611BNWP); Stirrer (096019); automatic or glass pipettes; 50-mL cylinder; 1-L volumetric flasks; 100-mL beakers; OSTER Model 6641 blender or equivalent. Optional: printer (Orion 1010006); RS232 computer interface cable (1010053).

Required Solutions

0.1M Sodium Chloride Standard (Orion 941706); Sodium Ionic Strength Adjustor (ISA) (Orion 841111); Filling Solution (Orion 900010); Sodium Reconditioning Solution (Orion 841113); Sodium Electrode Storage Solution (Orion 841101); Electrode Rinse Solution (Customer prepared); deionized water.

Solutions Preparation

Electrode Rinse Solution is prepared by adding 10 mL of the ISA to a 1 liter squeeze bottle and filling it with DI water.

Meter Setup

Connect the electrode to one of the BNC inputs on the meter and note which channel is selected. Connect a stirrer to the meter. Refer to the Orion Dual Star User Guide to set up Electrode ID to Sodium (Na⁺), Measurement Mode to ISE, resolution to 3, units to mg/L, Data Log to ON, Export Data to Printer, Format to Printer or PC (for comma delimited), Stirrer Speed to 4, Incremental Techniques to Double Known Addition. If all steps were followed correctly, the meter display will show “enter sample volume” prompt on the bottom of the screen.

Electrode Setup

See the electrode user guide for preparation of the electrode.

Electrode Performance Check

Check slope at least daily according to the procedure described in the electrode user guide. Drift may be checked by comparing a 1 minute to a 2 minute reading. If electrode slope is low or electrode drifts, and performance cannot be restored by soaking in sodium electrode storage solution, recondition electrode in the reconditioning solution for 1 min., then rinse with rinsing solution and soak in sodium electrode storage solution for 15 min. before returning to use.

Electrode Storage, Soaking, and Rinsing

For short-term storage (1 week or less) soak the electrode in sodium electrode storage solution. For storage longer than one week, see the electrode user guide.

Sample Preservation

None required. Store potato chips according to manufacturer's direction.

Sample Preparation

Crush potato chips in a blender. Accurately weigh out about 3.5 g of finely crushed sample into 1 L volumetric flask. Record sample weight. Fill the volumetric flask to the mark with DI water. Mix thoroughly. Measure 50 mL aliquot of the prepared solution into an analysis beaker and add 5 mL of ISA.

Analysis

Place electrode in the prepared sample. Press the Start key to initiate the analysis. Follow the directions on the meter's screen to enter 50 mL for the sample volume, 55 for the total volume in mL, and 2299 for the concentration of sodium standard in mg/L. When reading is stable, press Yes key. When prompted, enter 0.5 mL for the volume of the first increment of the standard to be added to the sample and press accept key. Add this volume to the sample and press Yes key. When reading is stable, press Yes key and enter 5 for the volume of the second increment of the standard. Add the second increment of the standard and press Yes key. When reading is stable, press Yes key. The result of the analysis and the electrode slope will be displayed. Press the Log/Print key to print the result and save it in the Data Log.

Use the following formula to calculate sodium concentration per serving:

$$\text{mg Na}^+ \text{ per serving (28 g)} = (\text{mg/L Na}^+ \text{ found by DKA}) * (\text{volume of volumetric flask in L}) * 28 / (\text{sample weight in g})$$

Quality Control (QC)

Recommended QC procedures include: sodium standard and reagent blank analysis, sample duplicates, QC sample, and/or matrix spikes.



Sodium in potato chips by Double Known Addition Method on the Orion Dual Star Meter

Sample ID	Sodium concentration in the prepared sample, mg/L	mg of Sodium per serving	% Recovery (found vs. expected per serving according to product label)
Sample 1	25.9	204	101.9%
Sample 2	24.9	196	98.0%
Sample 3	24.7	194	97.2%
Sample 4	25.3	199	99.5%
Average	25.2	198	99.1%
STDEV	0.529		
%CV	2.1%		
Matrix spike (15 mg/L)	40.6		
Spike recovery, %	102.7%		

Below is an example of DKA printout

Dual-Channel Star BENCHTOP
 Meter S/N E01101
 SW rev 1.5
 6/21/2010 17:11:52

Channel # CH1
 Electrode ID SODIUM
 Electrode S/N 12081
 ATC Channel # MANUAL
 Method # M100

Double Known Addition
 Sample -99.8 mV
 Sample Volume 50 mL
 Total Volume 55 mL
 STD Concentration 2299
 Standard Volume 1 0.5 mL
 1st Point -83.3 mV
 Standard Volume 2 5 mL
 2nd Point -40.2 mV
 Slope 59.87 mV/dec
 Temperature 23.7 C
 Sample Concentration 25.3