APPLICATION NOTE

Measuring calcium in fruit juice

Water Analysis Instruments,
Thermo Fisher Scientific

Key words
calcium, electrode, ISE, Orion 9720BNWP, measure, determination, juice, Orion meter, beverage, food

Goal

This application note provides rapid, uncomplicated determinations for the free calcium ions in fruit juice.

Introduction

The direct measurement of ions using an ion selective electrode is a well established and frequently used standard method of analysis. This analysis is used as a quality control step and to fulfill labeling requirements. This procedure eliminates interferences associated with presence of color and solids.

Recommended equipment

- Thermo Scientific™ Orion™ pH/ISE benchtop meter (Thermo Scientific™ Orion Star™ A214, Thermo Scientific™ Orion™ Versa Star Pro™, or equivalent)
- Thermo Scientific™ Orion™ ionplus™ calcium electrode
- Stirring probe for benchtop meter

Optional

- Thermo Scientific Orion ATC probe

Required solutions

- Thermo Scientific Orion Calcium standard, 0.1M as $CaCl_2$
- Thermo Scientific Orion Calcium ISA Solution
- Thermo Scientific Orion reference filling solution, Optimum Results A
- Laboratory Reagent Water (LRW)

Solution preparation

Prepare a 40 ppm calcium standard by pipetting 1 mL of 0.1M (4000 ppm) calcium standard in a 100 mL volumetric flask, add 2 mL of calcium ISA and dilute to the mark with

LRW. Mix well. Prepare a 4 ppm calcium standard by pipetting 10 mL of the 40 ppm calcium standard in a 100 mL volumetric flask, add 2 mL of calcium ISA and dilute to the mark with LRW. Mix well. Use 30 mL of each of these standards for calibration.

Meter setup

Connect the electrode, stirrer and ATC probe to the Orion meter. Set measurement mode to ISE. In Setup mode of the meter, set resolution to 3, select ppm as the unit and read type to continuous.

Electrode setup

See the electrode manual for preparation of the electrode.

Electrode performance check

Check slope at least daily according to the electrode manual. Drift may be checked by comparing a 1 minute to a 2 minute reading. Results should agree with desired criteria. See troubleshooting section of manual if you experience slope or drift problems.

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Electrode storage, soaking and rinsing

See electrode manual for storage between measurements, overnight, and for long periods of time. Between measurements, rinse the electrode and stirrer probe with LRW and blot gently or shake gently to remove excess water droplets. Do not wipe or rub the sensing element of the electrode.

Sample preservation

None required.

Sample preparation

Pipette 50 mL of fruit juice into a 200 mL volumetric flask or graduated cylinder. Dilute to the 200 mL mark with LRW and mix well.

Calibration

Perform a two point calibration using the 4 ppm and 40 ppm calcium standards. The electrode slope will be displayed and should be between 25 and 30 mV/decade. Read a fresh portion of standard to verify calibration. If readings are not acceptable, see troubleshooting section of manual.

Analysis

Rinse electrode, ATC probe and stirrer with LRW and shake gently or blot gently to dry. Pour a 50 mL portion of the sample into a beaker, and add 1 mL ISA to the sample aliquot. Place probes in sample, turn on stirrer and measure. When the display stops flashing and "ready" is shown, take the reading. Multiply the meter reading by the dilution factor (in this case 4) to obtain the final results.

Quality Control (QC)

Recommended QC procedures include: calibration and calibration verification, sample duplicates, slope, matrix spikes, lab control samples and/or MDL.

Fruit Juice	Direct Readings Calcium (ppm)	Final Results Calcium (ppm)
Sample 1	10.1	40.4
Sample 2	10.3	41.2
Sample 3	10.5	42.0
Sample 4	10.7	42.8
Sample 5	10.4	41.6
Mean	10.4	41.6
Std. deviation	0.2	0.9
%CV	2.2	2.2

To purchase Thermo Scientific laboratory products, please contact your local equipment distributor and reference the part numbers listed below:

Product	Description	Cat. No.
Meters	Thermo Scientific Orion Star A214 pH/ISE Benchtop Meter	STARA2140
	Thermo Scientific Orion Versa Star Pro 40 pH/ISE Benchtop Meter Set	VSTAR40A
	Thermo Scientific Orion Stirrer Probe	096019
	Thermo Scientific Orion ATC Probe	927007MD
Solutions	Thermo Scientific Orion Calcium Standard, 0.1M as $CaCl_2$	922006
	Thermo Scientific Orion Calcium ISA Solution	932011
	Thermo Scientific Orion reference fill solution, Optimum Results A	900061
Laboratory Reagent Water	Thermo Scientific Barnstead Smart2Pure 12 UV Water Purification System	50129890*

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