



Parameter and Sample Type

Nitrate in Drinking Water

Introduction

The ion-selective electrode method is an EPA-compliant test procedure to directly read nitrate in drinking water. Laboratory productivity is improved with quick, uncomplicated determination. Use of Nitrate Interference Suppressor Solution frees the ISE method from most interferences.

References

1. Method 4500-NO₃⁻ D-2000. Standard Methods for the Examination of Water and Wastewater. APHA, AWWA, & WEF, Washington, D.C. www.standardmethods.org
2. Standard Method of Test for Nitrate in Drinking Water, July 1994, Orion Technical Bulletin 601.

Result Statistics

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Recommended Equipment

Orion Star Plus Benchtop Meter (Orion 1112000) or Orion Dual Star Meter (Orion 2115000); Ionplus® Nitrate Electrode (Orion 9707BNWP); benchtop stirrer (Orion 096019). Optional: ATC probe (Orion 927005MD); printer (Orion 1010006); Star Navigator Software (Orion 1010007).

Required Solutions

Nitrate Standard, 1000ppm as N (Orion 920707); Nitrate Interference Suppressor Solution (NISS) (Orion 930710); Reference Filling Solution, Optimum Results™ F (Orion 900046); deionized water (DI).

Solutions Preparation

1. Prepare 1 ppm (mg/L) nitrate standard by pipetting 0.1 mL of 1000 ppm standard into a 100 mL volumetric flask and diluting to the mark with deionized water.
2. Prepare 10 ppm (mg/L) nitrate standard by pipetting 1 mL of 1000 ppm standard into a 100 mL volumetric flask and diluting to the mark with deionized water.
3. Prepare 50 ppm (mg/L) nitrate standard by pipetting 5 mL of 1000 ppm standard into a 100 mL volumetric flask and diluting to the mark with deionized water.

Meter Setup

Connect the electrode, stirrer and ATC probe to the meter. Set measurement mode to ISE. In Setup mode, set resolution to 3, turn on the auto blank correction, set the range to high (Star Plus meter only), and select mg/L as the unit. If all steps were followed correctly, the meter display will show three digits in the top line and "ISE: mg/L" to the right of the top line. The temperature will also be displayed in the top left of the screen (if ATC is used).

Electrode Setup

See the electrode manual for preparation of the electrode.

Electrode Performance Check

Check slope at least daily according to the electrode manual. See troubleshooting section of manual if slope or drift problems.

Electrode Storage, Soaking, and Rinsing

See electrode manual for storage 1) between measurements, 2) for short period of time (2-3 days), and 3) for long periods of time.

Sample Preservation

No preservation required. Store samples at ≤ 6 °C. Analyze within 48 hours.

Sample Preparation

For precise measurements, allow all standards and samples to reach room temperature before analysis. Measure 10mL of sample and 10mL of NISS into a 50mL beaker. NISS must be added to all standards and samples. A larger sample size can be used if desired as long as NISS is added in a 1:1 ratio.

Calibration

Perform a three point calibration using 1 mg/L, 10 mg/L, and 50 mg/L nitrate standards. The calibration slope should be negative with an absolute value of 50mV/decade or greater. Read a fresh portion of a mid-level standard to verify calibration. If reading is not acceptable, see troubleshooting section of electrode manual.

Analysis

Rinse electrode, ATC probe and stirrer with DI water and shake electrode to dry sensing element. Place all probes in sample, turn on stirrer and measure. The concentration of the sample will be displayed. When a stable reading is achieved, the "ISE:mg/L" icon will stop flashing.

Quality Control (QC)

Recommended QC procedures include: calibration and calibration verification, initial demonstration of laboratory capability and method detection limit determination, laboratory control samples (LCS), method blanks, matrix spikes (MS), sample duplicates, and independent reference materials. See Reference 1 above for details.



Result Statistics

Results for standards, water blank, spikes, a commercially-available performance evaluation (PE) sample, and six drinking water samples

Parameter	Criteria	Result
Calibration Curve Slope	Negative with abs value >50mV/dec	-57.3 mV/dec
1.0 mg/L	80-120% R	102% R
10.0 mg/L	80-120% R	103% R
50.0 mg/L	80-120% R	100% R
3.0 mg/L	80-120% R	97% R
5.0 mg/L	80-120% R	96% R
20.0 mg/L	80-120% R	96% R
Blank	< 0.10 mg/L*	0.07 mg/L
10 mg/L Cal Verification	80-120% R	101% R
Drinking Water Sample 1		0.31 mg/L
Drinking Water Sample 2		0.31 mg/L
Drinking Water Sample 3		0.31 mg/L
Drinking Water Sample 4		0.29 mg/L
Drinking Water Sample 5		0.30 mg/L
Drinking Water Sample 6		0.31 mg/L
Drinking Water Mean		0.30 mg/L
Drinking Water Std Dev		0.01 mg/L
Drinking Water % CV		2.6%
1.0 mg/L Spike	No Criteria for Matrix Spike	91% R
1.0 mg/L Spike Dupl.	No Criteria for Matrix Spike	91% R
PE Replicate 1	5.02-6.46 mg/L	5.67 mg/L
PE Replicate 2	5.02-6.46 mg/L	5.69 mg/L
PE Replicate 3	5.02-6.46 mg/L	5.74 mg/L
PE Replicate 4	5.02-6.46 mg/L	5.74 mg/L

* The MDL for this method was determined to be 0.10 mg/L.

Water Nitrate Concentration of PE samples with Ionplus Nitrate Electrode & Orion Star Plus Meter

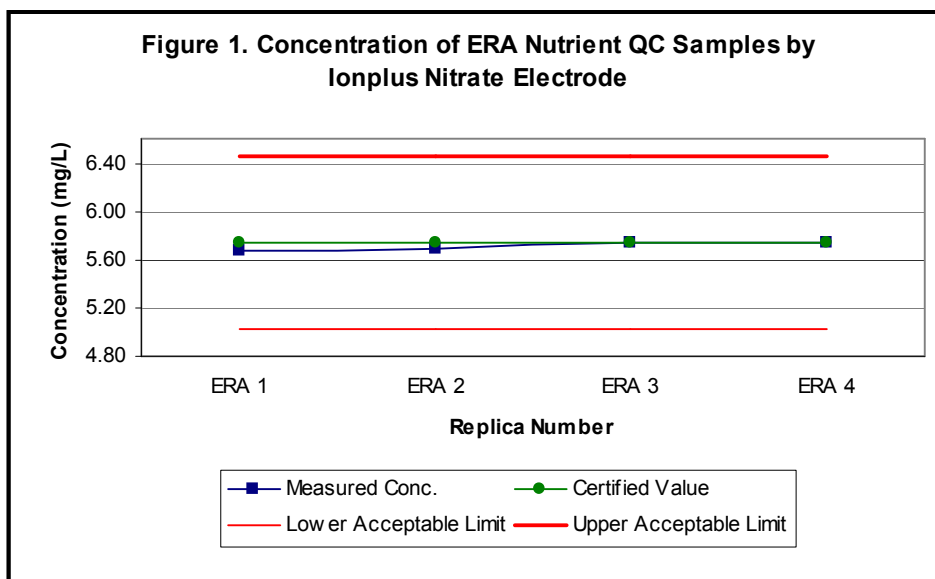


Figure 1: The QC sample (ERA Cat. No. 4023) has a certified concentration value of 5.74 mg/L and Acceptance Limits of 5.02 - 6.46 mg/L. The results of four replicates were very reproducible (STDEV=0.04mg/L) and accurate (well within the acceptable limits).