

# Low-Cost Determination of Anions in Municipal Drinking Water Using EPA Method 300.0 and the Dionex ICS-900 IC System

Fei Pang, Terri Christison, Khalid Divan  
Thermo Fisher Scientific, Sunnyvale, CA

## Introduction

U.S. EPA 300.0<sup>1</sup> is an ion chromatography (IC) method approved by the United States Environmental Protection Agency (EPA) to determine inorganic anions (fluoride, chloride, nitrite, sulfate, bromide, nitrate, and phosphate) in municipal drinking water and wastewater. Three of these anions (fluoride, nitrite, and nitrate) are considered contaminants in drinking water under the EPA's National Primary Drinking Water Regulations. High levels of fluoride cause bone disease; nitrite and nitrate can cause birth defects. Chloride and sulfate are not harmful to public health but should not exceed 250 mg/L for the proper taste of water, according to the EPA's National Secondary Drinking Water Regulations. The EPA enforces these regulations to ensure use of approved analytical methods when analyzing water samples to meet federal monitoring requirements or to comply with drinking water regulations.

The work shown here describes the determination of inorganic anions in drinking water with the Thermo Scientific™ Dionex™ ICS-900 IC system and EPA Method 300.0. The Dionex ICS-900 IC system is an integrated, single-channel IC system designed for isocratic applications with suppressed conductivity detection.



Figure 1. Dionex ICS-900 system

The system facilitates continuous chemical suppression with Thermo Scientific™ Dionex™ MMS™ MicroMembrane™ Suppressor technology to enhance detector response, provide low baseline noise, and prevent baseline drift. The Dionex ICS-900 IC system is designed for low maintenance costs and maximum uptime, making it a great choice for routine analysis.

To demonstrate the capability of the Dionex ICS-900 IC for water analysis, municipal drinking water of the city of San Jose, CA, was analyzed at ambient temperature with the Thermo Scientific™ Dionex™ IonPac™ AS22 column. The experimental result is shown in Figure 2.

All seven anions were separated and eluted within 13 min. Chloride was the most abundant anion in the sample, followed by sulfate, and their concentrations were determined to be 98 and 48 mg/L, respectively. Fluoride and nitrite were detected at less than 1 mg/L, which was below the maximum amount allowed by EPA regulations. The concentration of nitrate was determined to be 2.43 mg/L, which met the safety criterion (less than 10 mg/L) set by the National Primary Drinking Water Regulations.

### Conditions

The Dionex ICS-900 IC system, Thermo Scientific Dionex AS-DV Autosampler, and Thermo Scientific™ Dionex™ Chromeleon™ Chromatography Data System (CDS) software are used in this experiment. All experimental parameters are listed in Figure 2.

### Sample Information and Preparation

Municipal drinking water of the city of San Jose, CA, was analyzed by IC without sample pretreatment.

### Conclusion

The Dionex ICS-900 IC system provides a complete solution for routine analysis of inorganic anions in water and meets all requirements specified in EPA Method 300.0. A thorough discussion on anion determinations in municipal drinking water using carbonate eluents can be found in Dionex (now part of Thermo Scientific) Application Note 133.<sup>2</sup>

Column:	Dionex IonPac AG22, AS22, 4 mm
Eluent:	4.5 mM Sodium Carbonate 1.4 mM Sodium Bicarbonate
Column Temp.:	Ambient
Flow Rate:	1.2 mL/min
Inj. Volume:	25 µL
Detection:	Conductivity, Suppressed Conductivity Thermo Scientific™ Dionex™ AMMS™ 300 Anion MicroMembrane suppressor, 50 mM Sulfuric Acid
Peaks:	1. Fluoride 0.19 mg/L 2. Chloride 98.1 3. Nitrite 0.54 4. Bromide 1.22 5. Nitrate 2.43 6. Phosphate 3.12 7. Sulfate 48.2

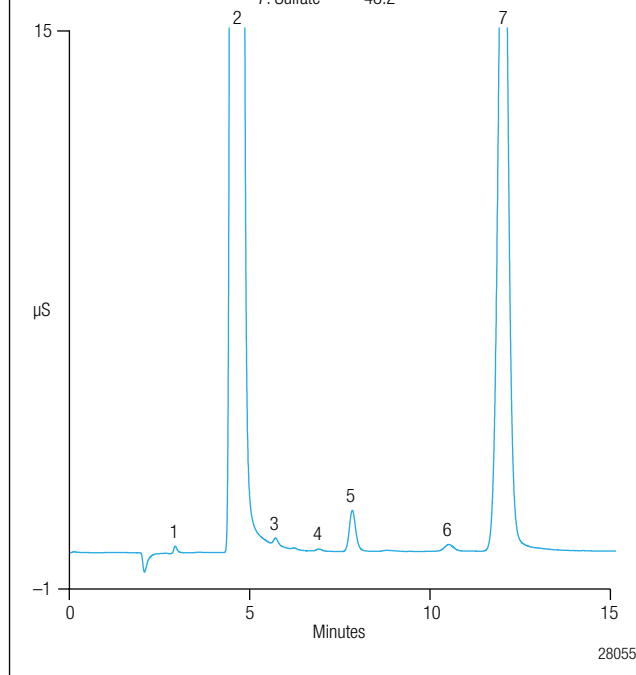


Figure 2. Separation of anions in municipal drinking water sample on the Dionex IonPac AS22 column using the Dionex ICS-900 IC system

### References

1. *The Determination of Inorganic Anions in Water by Ion Chromatography*; Method 300.0, Revision 2.1; U.S. Environmental Protection Agency: Cincinnati, OH, 1993.
2. Dionex (now part of Thermo Scientific). *Determination of Inorganic Anions in Drinking Water by Ion Chromatography*. Application Note 133, LPN 1192; Sunnyvale, CA, 2004.

[www.thermofisher.com/dionex](http://www.thermofisher.com/dionex)

©2016 Thermo Fisher Scientific Inc. All rights reserved. All trademarks are the property of Thermo Fisher Scientific and its subsidiaries. This information is presented as an example of the capabilities of Thermo Fisher Scientific products. It is not intended to encourage use of these products in any manners that might infringe the intellectual property rights of others. Specifications, terms and pricing are subject to change. Not all products are available in all countries. Please consult your local sales representative for details.

**Africa** +43 1 333 50 34 0  
**Australia** +61 3 9757 4300  
**Austria** +43 810 282 206  
**Belgium** +32 53 73 42 41  
**Brazil** +55 11 3731 5140  
**Canada** +1 800 530 8447  
**China** 800 810 5118 (free call domestic)  
400 650 5118

**Denmark** +45 70 23 62 60  
**Europe-Other** +43 1 333 50 34 0  
**Finland** +358 9 3291 0200  
**France** +33 1 60 92 48 00  
**Germany** +49 6103 408 1014  
**India** +91 22 6742 9494  
**Italy** +39 02 950 591

**Japan** +81 6 6885 1213  
**Korea** +82 2 3420 8600  
**Latin America** +1 561 688 8700  
**Middle East** +43 1 333 50 34 0  
**Netherlands** +31 76 579 55 55  
**New Zealand** +64 9 980 6700  
**Norway** +46 8 556 468 00

**Russia/CIS** +43 1 333 50 34 0  
**Singapore** +65 6289 1190  
**Sweden** +46 8 556 468 00  
**Switzerland** +41 61 716 77 00  
**Taiwan** +886 2 8751 6655  
**UK/Ireland** +44 1442 233555  
**USA** +1 800 532 4752

**Thermo**  
SCIENTIFIC

Part of Thermo Fisher Scientific