

Determination of Anions in Municipal Drinking Water by Fast IC Using an Hydroxide Eluent

The determination of inorganic anions (fluoride, chloride, nitrite, sulfate, bromide, nitrate, and phosphate) in municipal drinking water is one of the most important ion chromatography (IC) applications worldwide. In the United States (U.S.), water integrity is legislated through the Safe Drinking Water Act (SDWA), which ensures water quality and safety.¹ Other industrialized countries have similar regulations and, therefore, similar analytical needs.

Since the 1980s, with the approval of the U.S. Environmental Protection Agency (EPA) Method 300.0 (Part A), Dionex IC methods have been used for compliance testing of inorganic anion determinations. In 1993 and 1997, IC methods using Thermo Scientific Dionex IonPac™ AS4A and Dionex IonPac AS9-HC anion-exchange columns were specified in U.S. EPA Methods 300.0 (Part A) and 300.1 (Part A).^{2,3} As advancements in column technology continued, new columns were proposed, such as the Dionex IonPac AS18 column in Dionex Application Note (AN) 154 in 2003.⁴ However, both methods have run times exceeding 15 min.

In this study, mg/L concentrations of inorganic anions in a municipal drinking water sample were separated using a 2 × 150 mm, IonPac AS18-Fast anion-exchange column designed for fast separations using electrolytically generated hydroxide eluents. The Thermo Scientific Dionex ICS-5000 Reagent-Free™ IC (RFIC™) instrument was selected for this method to demonstrate the latest instrument technology. These results, shown in Figure 1, demonstrated the separation of mg/L concentrations of six anions in a municipal drinking water sample using hydroxide eluent at 0.45 mL/min. All anions were eluted from the column within 5 min and detected by suppressed conductivity detection.

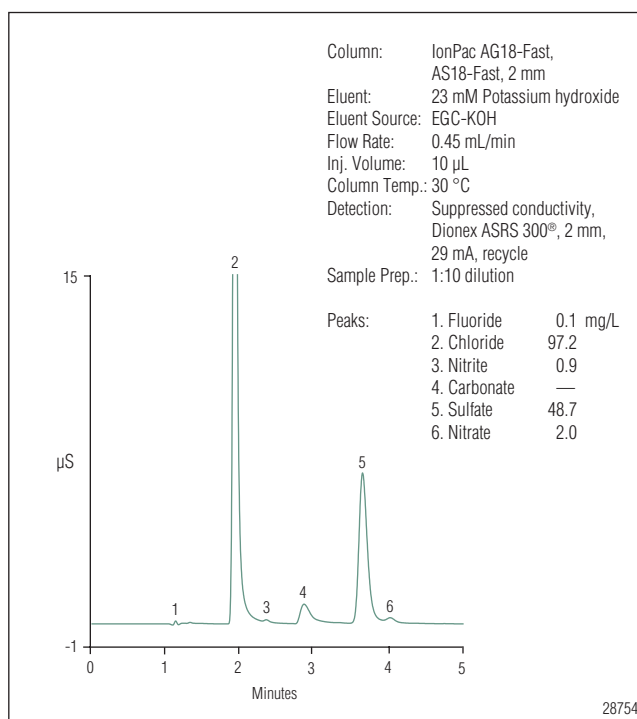


Figure 1. Determination of anions in a municipal drinking water sample by Fast IC on an IonPac AS18-Fast column using an RFIC system.

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This method has the advantage of a fast separation which reduces cycle time, thereby resulting in a three-fold improvement in sample analyses over the methods specified in U.S. EPA Methods 300.0 and 300.1, saving time, money, and labor. The eluent is electrolytically generated in-line using just deionized water, which provides precise and accurate eluent concentration without additional time and labor spent on eluent preparation. The ICS-5000 system has the advantages of ease-of-use and flexibility to analyze at capillary, microbore, or standard flow rates. In this method, the ICS-5000 system was used at microbore flow rates to provide inorganic anions determinations needed for environmental compliance testing. Anion determinations using an electrolytically generated hydroxide eluent are thoroughly discussed in Dionex AN 154.⁴

CONDITIONS

An ICS-5000 RFIC system including a Thermo Scientific Dionex AS-AP Autosampler and Thermo Scientific Dionex Chromeleon™ Chromatography Data System software were used for all analyses. The chromatography conditions are listed in Figure 1.

SAMPLE PREPARATION

The municipal drinking water sample was filtered with a 0.45 µm IC syringe filter prior to analysis.

REFERENCES

1. *National Primary Drinking Water Regulations*; Code of Federal Regulations, 40 CFR, Part 141; U.S. Environmental Protection Agency: Cincinnati, OH, 1998.
2. *The Determination of Inorganic Anions in Water by Ion Chromatography*; Method 300.0, rev 2.1; U.S. Environmental Protection Agency: Cincinnati, OH, 1993.
3. *The Determination of Inorganic Anions in Water by Ion Chromatography*; Method 301.0, rev 1.0; U.S. Environmental Protection Agency: Cincinnati, Ohio, 1997.
4. Thermo Fisher Scientific, *Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column*. Application Note 154, LPN 1539, 2003, Sunnyvale, CA.

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