



Application Note AN-S-353

Routine drinking water analysis

Robust analysis of major anions by ion chromatography

Water is the basis of all life. It is essential for any metabolism and it is our primary foodstuff. However, availability of water, especially in the needed drinking water quality, is limited. Therefore, quality control and risk assessment is of tremendous importance to manage the global drinking water supply. To accomplish this, reliable, fast, and robust techniques must be available for water laboratories or drinking water providers to perform valid analysis.

Ion chromatography (IC) is the method of choice to determine the concentration of common ions in water. This information is crucial as drinking water must meet certain standards to guarantee health (e.g.

nitrite and nitrate), as well as technical suitability (e.g. corrosiveness of chloride and sulfate).

The Eco IC is an ion chromatograph suitable for economical routine water analysis. It is fully automated and equipped with a conductivity detector, and optional chemical suppression. With this option, the background can be reduced significantly, increasing the signal to noise ratio, widening the detection range to ever lower limits. Using an A Supp 17 anion column, the analysis of major anions in drinking waters is robust and can be performed at ambient temperatures without additional temperature conditioning.

SAMPLE AND SAMPLE PREPERATION

Drinking water, which is usually particle-free and not turbid, is analyzed directly. However, for turbid samples and samples containing particles, filtration is recommended to prevent clogging of the system and

to improve the column lifetime. Inline Ultrafiltration is an optional add-on to automate sample filtration as an inline sample preparation step.

EXPERIMENTAL

The analysis is performed on a compact IC system, fully automated with a compact autosampler and Inline Ultrafiltration (**Figure 1**). The anions are separated on the analytical column Metrosep A Supp 17 - 150/4.0 using a sodium carbonate / sodium hydrogen carbonate eluent. The column is operated at ambient temperature, providing sufficient separation with lower technical complexity for thermostability. After separation, chemical suppression with the Metrohm Suppressor Module (MSM) reduces the background conductivity to approximately 10 $\mu\text{S}/\text{cm}$ and improves the S/N ratio. All anions are determined with a conductivity detector and quantified with the software MagIC Net.

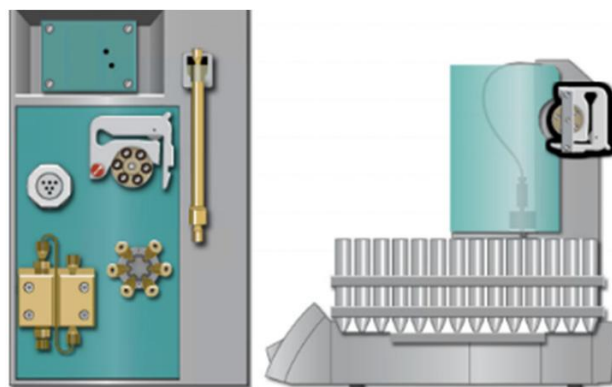


Figure 1. Compact and economic instrumentation to quantify anions in water: Eco IC with an 863 Compact Autosampler.

RESULTS

The calibration ranged from 0.05–2.50 mg/L for fluoride, nitrite, bromide, and phosphate, from 1–50 mg/L for chloride and nitrate, and 5–100 mg/L for sulfate.

Various drinking waters from Switzerland were analyzed in this study. **Figure 2** shows a typical chromatogram. The major inorganic anions measured were chloride (7–23 mg/L), nitrate (7–9 mg/L), and

sulfate (5–35 mg/L).

Fluoride concentrations were in the range of 0.05–0.090 mg/L. Nitrite, bromide, and phosphate were not detected in substantial amounts. All samples fulfilled the quality requirements of local (TBDV 817.022.11) and EPA regulations (Safe Drinking Water Act) with respect to the tested ions.

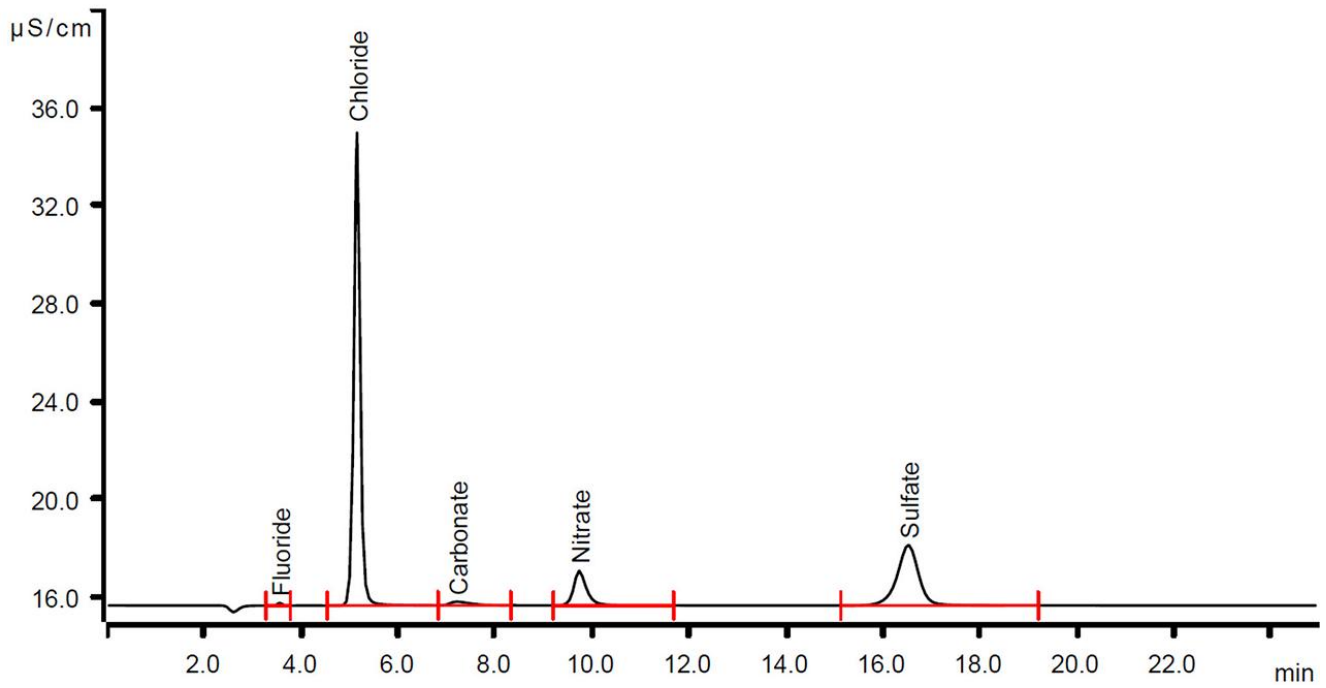


Figure 1. Chromatogram of common anions in drinking water analyzed with an Eco IC. The sample was injected with a 10 µL fixed volume loop. The conductivity was determined after chemical suppression and separation under ambient temperature with a Metrosep A Supp 17.

Table 1. Concentrations of typical anions in a drinking water sample. (n.q. = not quantified)

Analyte	Tap water 1 (mg/L)
Fluoride	0.07
Chloride	22.78
System peak / carbonate	n.q.
Nitrate	7.28
Sulfate	15.34

Table 1 summarizes the concentrations of the major anions in drinking water from a village in Eastern Switzerland. The repeatability of results was acceptable with the described setup. Limits of

detection were calculated according to EPA standards (EPA 608.3, 624.1, and 625.1) and were in the µg/L range for all tested anions.

CONCLUSION

Quality control for anions in drinking water is highly important to ensure that the waters meet the overall technical and health-related guidelines. Ion chromatography is a well-established multi-component technique for water analysis. It delivers

fast and reliable results. Both the purchase price and running costs of the robust Eco IC are low, thus making it a perfect tool for routine water analysis. Additional automation and Inline Ultrafiltration save time and reduce labor costs as optional equipment.

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CONTACT

Metrohm France
13, avenue du Québec - CS
90038
91978 VILLEBON
COURTABOEUF CEDEX

info@metrohm.fr

CONFIGURATION



Eco IC

La chromatographie ionique pour tous ! L'Eco IC constitue une option d'introduction à la chromatographie ionique à un prix très abordable. Cet appareil est particulièrement approprié pour les analyses de l'eau dans le cadre d'une utilisation de routine ou d'apprentissage dans des écoles ou des universités. Les éléments livrés comprennent le détecteur de conductivité, le Metrohm Suppressor Module « MSM » et le logiciel. Une automatisation ultérieure pour jusqu'à 36 échantillons ou l'emploi de l'ultrafiltration inline peuvent être envisagés à tout moment.



IC Conductivity Detector

Détecteur de conductivité haute performance compact et intelligent destiné aux appareils CI intelligents. Excellente constance de la température, tout le traitement du signal au sein du bloc de détecteur protégé et DSP – Digital Signal Processing – de la dernière génération garantissent une précision de mesure optimale. Grâce à la plage de travail dynamique, aucun changement de plage n'est nécessaire (même automatique).



Metrosep A Supp 17 - 150/4,0

La colonne de séparation Metrosep A Supp 17 - 150/4,0 est la colonne de choix pour la détermination d'anions, offrant de bonnes performances de séparation et des temps de séparation courts à température ambiante. Le débit maximal de 1,4 mL/min offre par ailleurs une possibilité d'optimisation de la détermination. Les colonnes Metrosep A Supp 17 séduisent par leur rapport performance/prix avantageux.



863 Compact IC Autosampler

Le 863 Compact IC Autosampler est l'auxiliaire par excellence pour l'analyse de routine. Il permet d'automatiser les chromatographes ioniques les plus divers de la gamme Metrohm.



Rotor MSM A

Rotor pour suppresseur pour tous les appareils CI avec MSM (Module Suppresseur Metrohm)



MagIC Net 4.0 Professional : 1 licence

Programme PC professionnel pour le contrôle de tous les systèmes Professional IC intelligents, des appareils Compact IC et leurs périphériques, de tous les détecteurs et des différents passeurs d'échantillons, du 800 Dosino, du 771 Compact Interface, etc. Le logiciel assure le contrôle, permet d'enregistrer, d'évaluer et de contrôler les données, ainsi que de générer les rapports d'analyses par chromatographie ionique.

Interface utilisateur graphique pour les opérations de routine, programmes gestionnaires de base de données complets, développement de méthodes, configuration et panneau de configuration manuel ; administration des utilisateurs très adaptable, opérations de bases de données performantes, fonctions d'exportation de données complètes, générateur de rapports personnalisable, commande et contrôle de tous les composants du système et des résultats de chromatographie.

MagIC Net Professional satisfait totalement à la directive FDA 21 CFR Part 11 ainsi qu'aux BPL.

MagIC Net est disponible dans 16 langues de dialogue : allemand, anglais, chinois, chinois traditionnel, français, italien, espagnol, portugais, bulgare, tchèque, hongrois, japonais, coréen, russe, slovaque, polonais

1 licence

L'installation et les documents sont fournis sur une clé USB.