

ANALYSIS OF INORGANIC CATIONS IN DRINKING AND WASTE WATER BY CATION EXCHANGE CHROMATOGRAPHY WITH CONDUCTIVITY DETECTION



Key words:

Drinking water, Wastewater, Inorganic Cations, Ion chromatography, Conductivity Detection.

Introduction:

Inorganic cations are significant indicators of the quality of drinking waters and their suitability for human consumption. They have important physiological effects and they alter the palatability of water. Waters high in calcium or magnesium are considered hard and are not desirable for domestic supplies. Several transition elements have toxic effects. The presence of aluminium ions in water can have significant implications for patients who require kidney dialysis.

Three different samples of water were analysed by Ion Chromatography to determine inorganic cations.

Sample A: Mineral water

Sample B: Tap water

Sample C: Wastewater.

The cations were resolved using a universal cation exchange column and methanesulfonic acid as eluent. Conductivity Detection was used to quantify the concentration of each cation against known standard solutions.

Sample treatment:

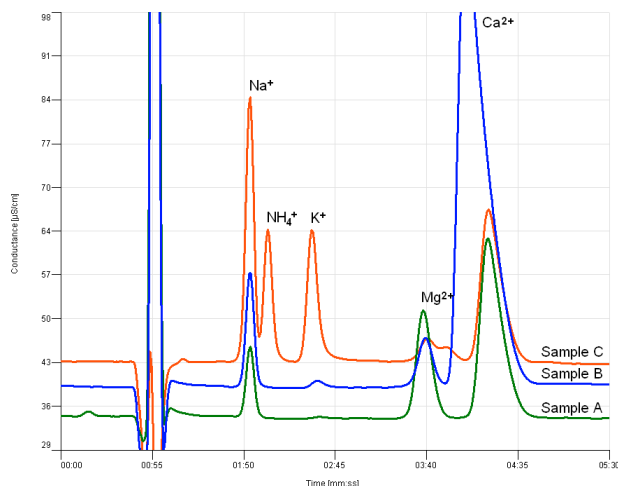
Samples A and B were injected without any pre-treatment.

Sample C was acidified with 1N HNO₃ upon collection and kept in a sealed bottle under 5°C until the moment of analysis. Prior to analysis, the sample was warmed up to room temperature and centrifuged at 5000rpm for 5 minutes to precipitate the suspended solids. The clear supernatant was diluted with deionised water and injected onto the column.

Chromatographic method:

Mobile phase: 5mM Methanesulfonic acid (MSA)
 Flow: 1.5mL/min
 Injection Volume: 20µL
 Analytical Column: Universal Cation 7µm 100x4.6mm supplied by Alltech Associates Ltd UK (A guard column was fitted)
 Column Temperature: 35°C

Typical chromatogram:



Ordering Information:

Adept System 8 IonQuest with PowerStream.

We supply Analytical Columns and Guard Column kits upon request.

Instrumentation:

Adept System 8 IonQuest consisting of:

CE 4100 HPLC Pump

CE 4120 Dynamic Mixer and Manual Injection Port

CE 4660 Column Oven

CE 4710 Conductivity Detector.

Analytical column: Alltech Universal Cation 100x4.6mm (PN 27106)

Chromatography software:

Cecil Instruments PowerStream chromatography system manager.

CE 4710 Operational parameters:

Range: -1000 µScm-1
 Offset: 2250 µScm-1
 Time constant: 1.0 sec
 Cell temperature: 35 °C

Samples:

A: Mineral water

B: Tap water

C: Wastewater

Analytes (mg/L):

	Sample A	Sample B	Sample C
Na+	4.52	7.45	72.03
NH ₄ ⁺	N/A	N/A	29.39
K+	N/A	0.56	36.30
Mg ²⁺	8.01	3.23	6.47
Ca ²⁺	32.13	(> 103)	106.56

Reagents:

Lithium Chloride "Sigmaultra" L-4408 Lot 108H02031; Sodium Chloride "Sigmaultra" S-7653 Lot 6841130 from Sigma Chemical Co.
 Potassium Nitrate "Romil SA" A7773 Batch J534450 from Romil Ltd.
 Ammonium Sulphate "AnalR" 155200H Batch 5195213215918 from Hopkins & Williams Ltd.
 Methanesulfonic acid 70% (w/w) in water. Reag. No. 471348 Batch # 06626BC from Sigma-Aldrich Inc.
 De-ionised water was produced on site using a Model 6C Houseman Hegro de-ioniser, with mixed bed ion exchange resins from Helga.