



Application Notes

Ionus

Version 1.04



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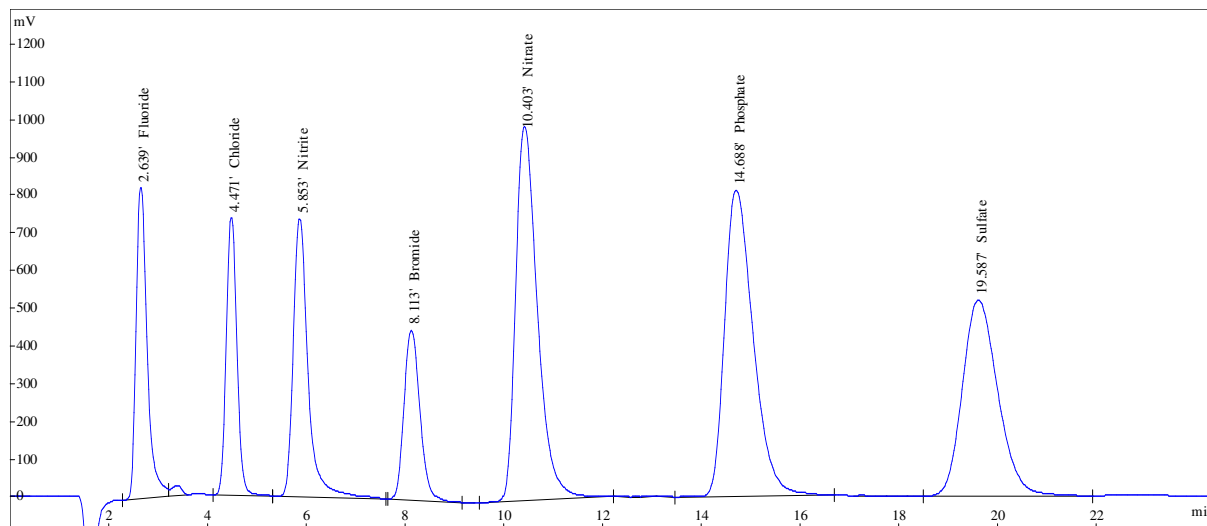
APPLICATION NOTE



Hamilton PRP-X100 – Separation of Anions

Equipment : IONUS
Column : PRP-X100, 5 µm, 50 mm x 4.1 mm ID, P/N 79810, S/N 68
(Hamilton Company, USA)
Eluent profile..... : isocratic
Eluent : 3.2 mM Sodium carbonate
1.0 mM Sodium hydrogen carbonate
0.1 mM Sodium thiocyanate
Flow : 700 µl/min
Temperature : 40 °C
Detection : Conductivity with suppressor
Injection volume..... : 20 µl
Sample : Fluoride 8 mg/l
Chloride 9 mg/l
Nitrite 10 mg/l
Bromide 20 mg/l
Nitrate 10 mg/l
Sulfate 30 mg/l
Phosphate 30 mg/l

Separation of Standard Solution



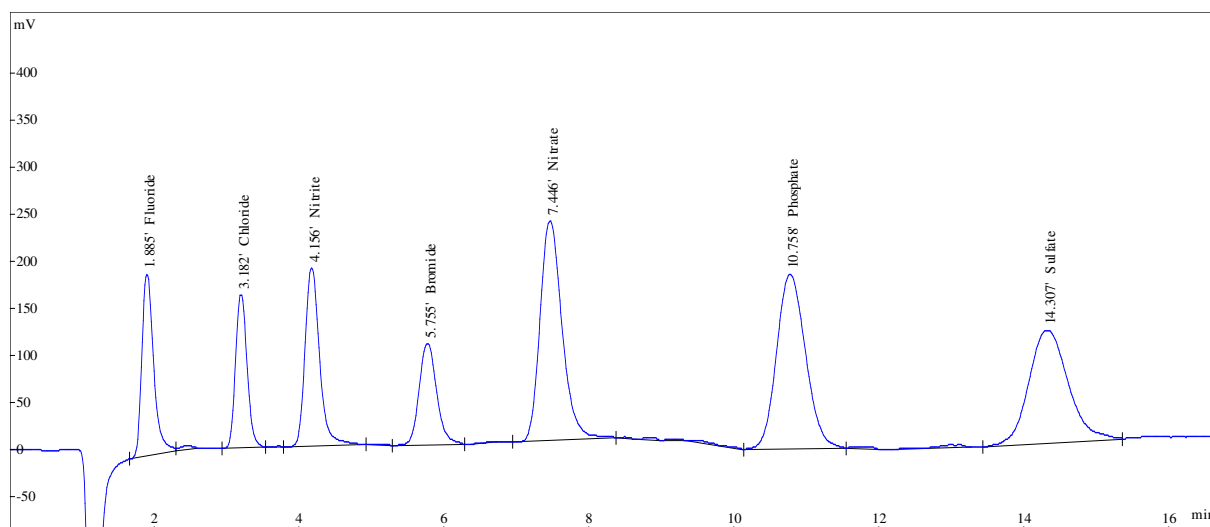
APPLICATION NOTE



Hamilton PRP-X100 – Separation of Anions

Equipment : IONUS
Column : PRP-X100, 5 μ m, 50 mm x 4.1 mm ID, P/N 79810, S/N 68
(Hamilton Company, USA)
Eluent profile..... : isocratic
Eluent : 3.2 mM Sodium carbonate
1.0 mM Sodium hydrogen carbonate
0.1 mM Sodium thiocyanate
Flow : 1000 μ l/min
Temperature : 50 $^{\circ}$ C
Detection : Conductivity with suppressor
Injection volume..... : 5 μ l
Sample : Fluoride 8 mg/l
Chloride 9 mg/l
Nitrite 10 mg/l
Bromide 20 mg/l
Nitrate 10 mg/l
Sulfate 30 mg/l
Phosphate 30 mg/l

Separation of Standard Solution



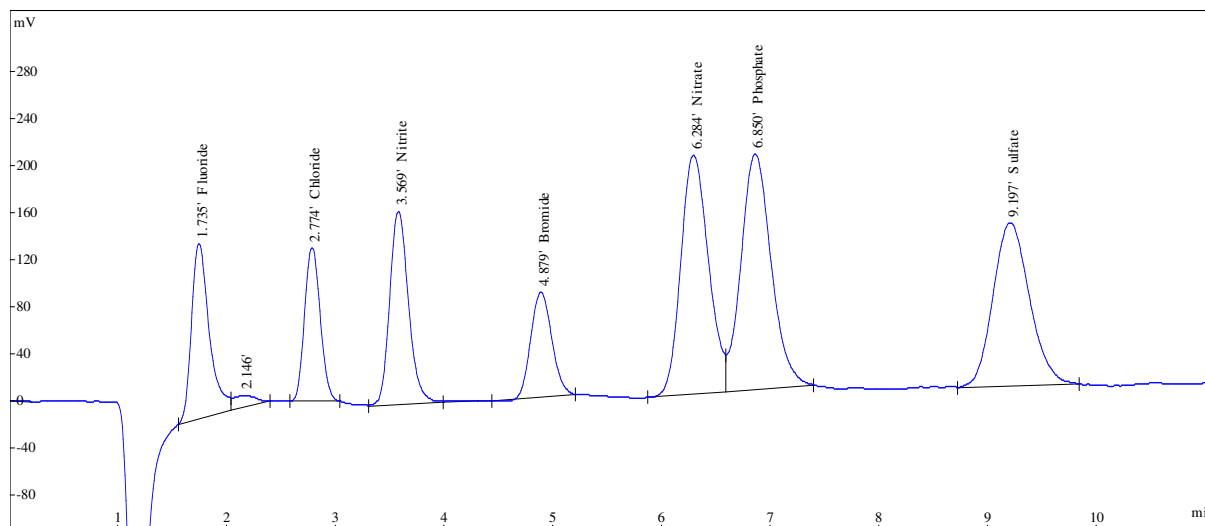
APPLICATION NOTE



Hamilton PRP-X100 – Separation of Anions

Equipment : IONUS
Column : PRP-X100, 5 µm, 50 mm x 4.1 mm ID, P/N 79810, S/N 68
(Hamilton Company, USA)
Eluent profile..... : isocratic
Eluent : 5.0 mM Sodium carbonate
1.5 mM Sodium hydrogen carbonate
0.1 mM Sodium thiocyanate
Flow : 1000 µl/min
Temperature : 50 °C
Detection : Conductivity with suppressor
Injection volume..... : 5 µl
Sample : Fluoride 8 mg/l
Chloride 9 mg/l
Nitrite 10 mg/l
Bromide 20 mg/l
Nitrate 10 mg/l
Sulfate 30 mg/l
Phosphate 30 mg/l

Separation of Standard Solution



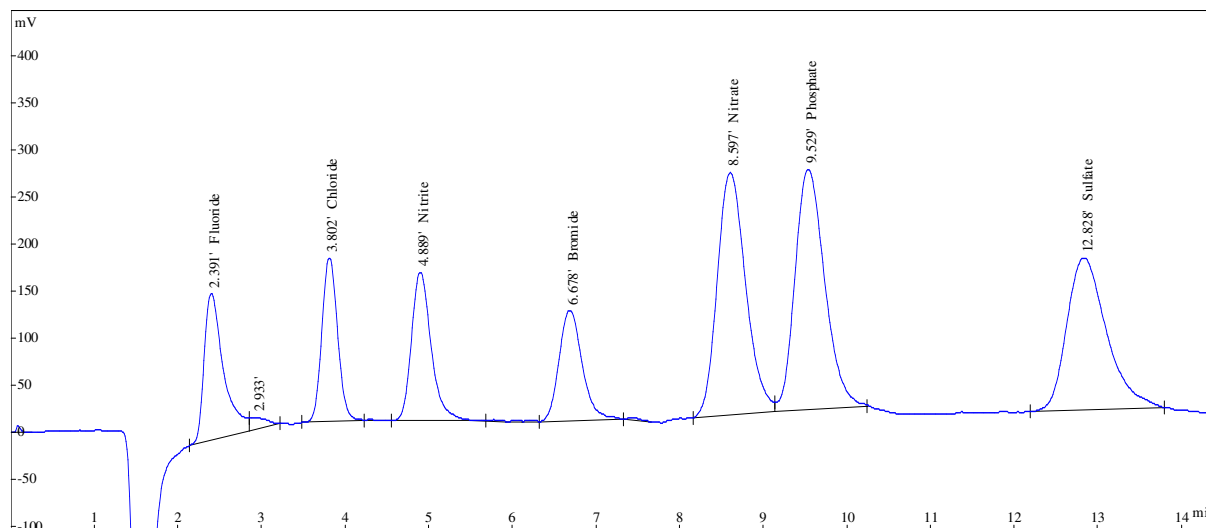
APPLICATION NOTE



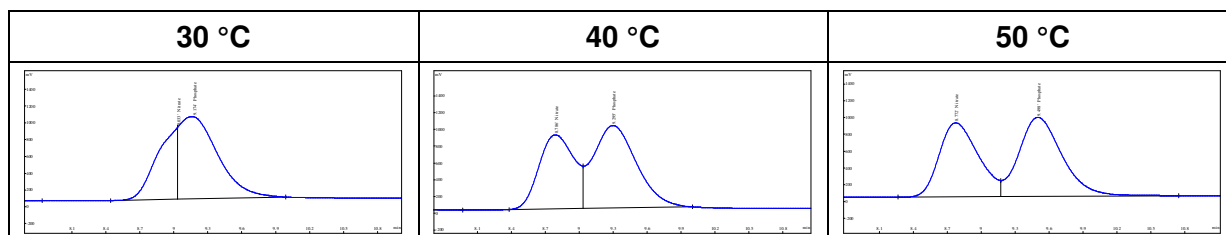
Hamilton PRP-X100 – Separation of Anions

Equipment : IONUS
Column : PRP-X100, 5 μ m, 50 mm x 4.1 mm ID, P/N 79810, S/N 68
(Hamilton Company, USA)
Eluent profile..... : isocratic
Eluent : 5.0 mM Sodium carbonate
1.5 mM Sodium hydrogen carbonate
0.1 mM Sodium thiocyanate
Flow : 700 μ l/min
Temperature : 50 $^{\circ}$ C
Detection : Conductivity with suppressor
Injection volume..... : 5 μ l
Sample : Fluoride 8 mg/l
Chloride 9 mg/l
Nitrite 10 mg/l
Bromide 20 mg/l
Nitrate 10 mg/l
Sulfate 30 mg/l
Phosphate 30 mg/l

Separation of Standard Solution



Temperature Dependence: Separation of Nitrate and Phosphate (20 μ l injected)



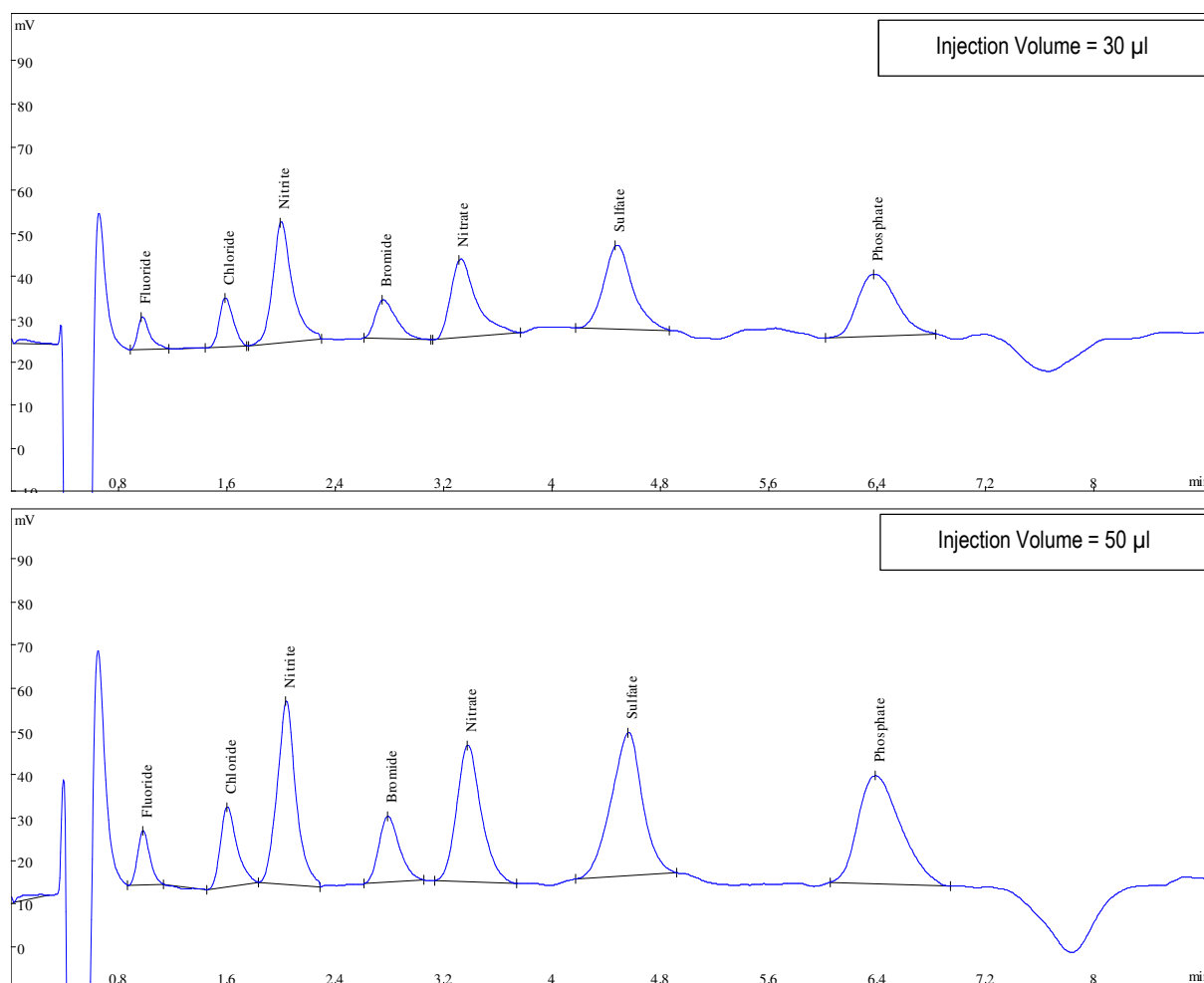
APPLICATION NOTE



Hamilton PRP-X100 – Separation of Anions

Equipment : IONUS
Column : PRP-X100, 5 μ m, 50 mm x 4.1 mm ID, P/N 79810, S/N 68
(Hamilton Company, USA)
Eluent profile..... : isocratic
Eluent : 4.0 mM p-Hydroxybenzoic Acid, pH 9.0 (Sodium hydroxide),
2.5 % Methanol,
0.1 mM Sodium Thiocyanate
Flow : 1000 μ l/min
Temperature : 30 $^{\circ}$ C
Detection : Conductivity
Injection volume..... : 30 μ l and 50 μ l
Sample : Fluoride 8 mg/l
Chloride 9 mg/l
Nitrite 10 mg/l
Bromide 20 mg/l
Nitrate 10 mg/l
Sulfate 30 mg/l
Phosphate 30 mg/l

Separation of Standard Solution



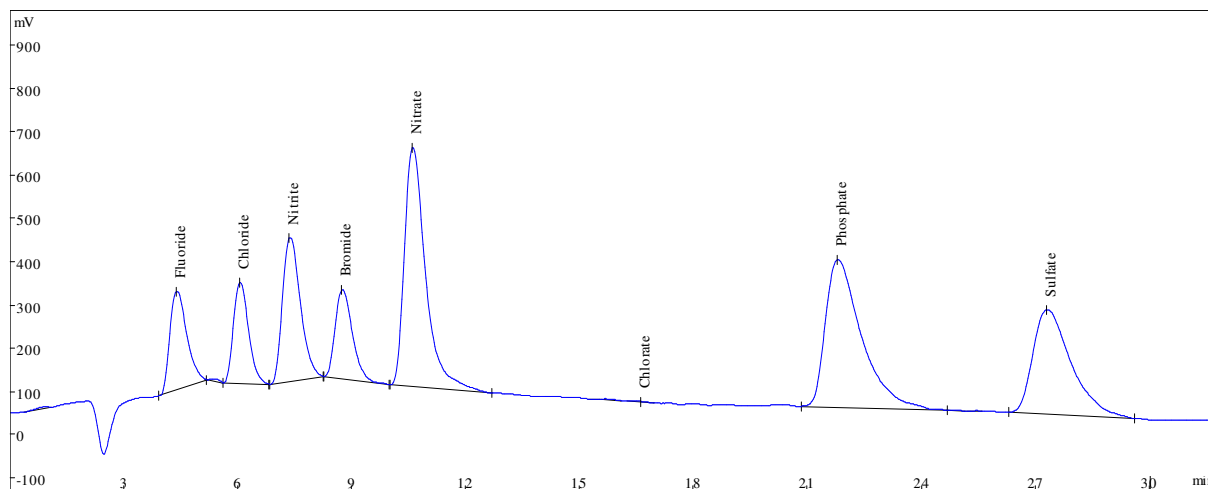
APPLICATION NOTE



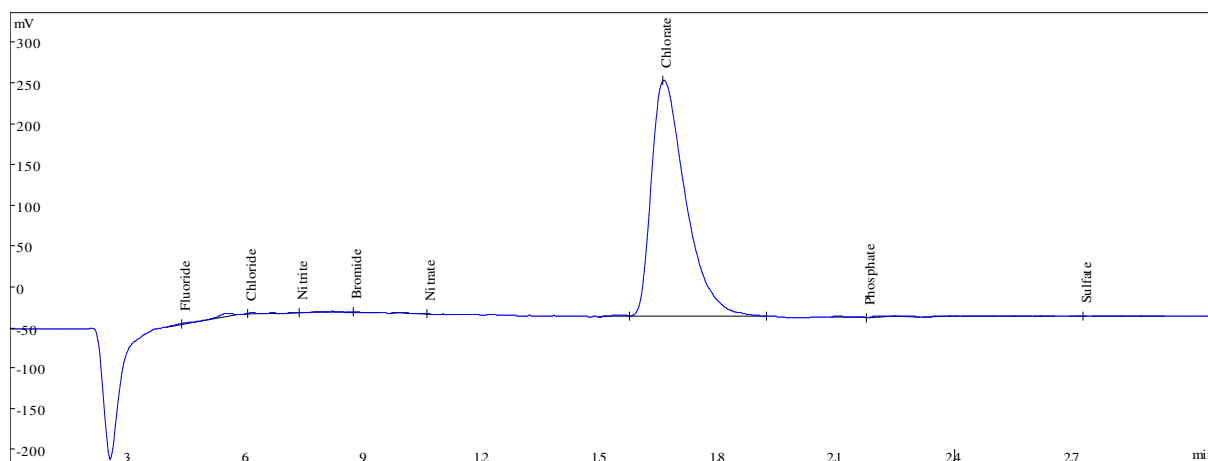
Hamilton PRP-X110S – Separation of Anions

Equipment : IONUS
Column : PRP-X110S, 7 μ m, 150 mm x 4.1 mm ID, P/N 79733, S/N 136
(Hamilton Company, USA)
Eluent profile..... : 1.8 mM Sodium carbonate
1.7 mM Sodium hydrogen carbonate
0.1 mM Sodium thiocyanate
Flow : 1000 μ l/min
Temperature : 50 $^{\circ}$ C
Detection : Conductivity with suppressor
Injection volume..... : 20 μ l
Sample : Fluoride 8 mg/l
Chloride 9 mg/l
Nitrite 10 mg/l
Bromide 20 mg/l
Nitrate 10 mg/l
Sulfate 30 mg/l
Phosphate 30 mg/l

Separation of 7 Anion Standard Solution



Separation of Chlorate Standard Solution



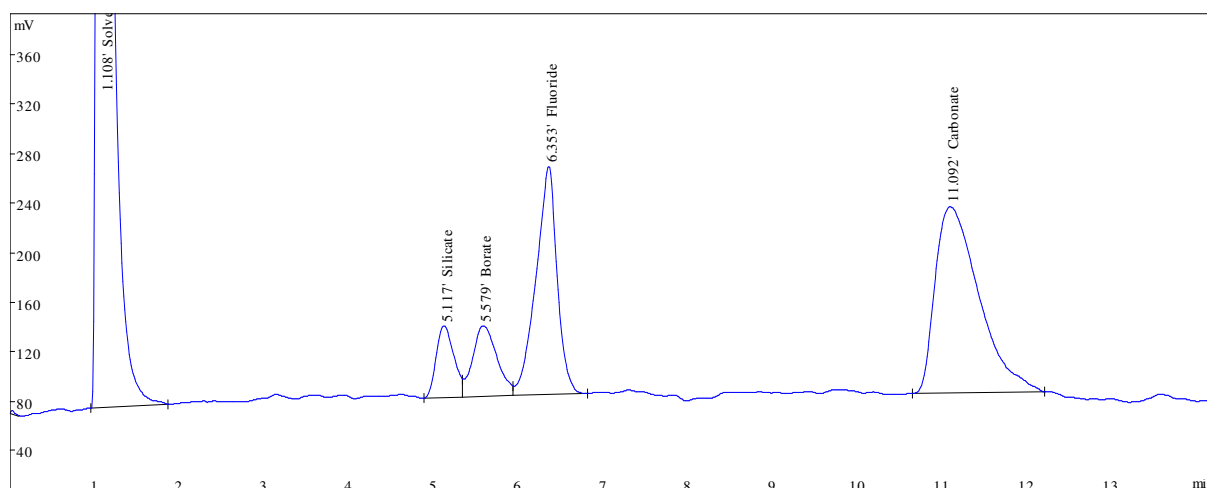
APPLICATION NOTE



Hamilton PRP-X110 – Analysis of Silicate

Equipment : IONUS
Column : PRP-X110, 7 µm, 150 mm x 4.1 mm ID, P/N 79732, S/N 152
(Hamilton Company, USA)
Eluent profile..... : 0.5 mN Sodium Hydroxide
0.5 mM Sodium Benzoate
Flow : 1000 µl/min
Temperature : 30 °C
Detection : Conductivity
Injection volume..... : 20 µl
Sample : Silicate 25 mg/l
Borate 25 mg/l
Fluoride 25 mg/l

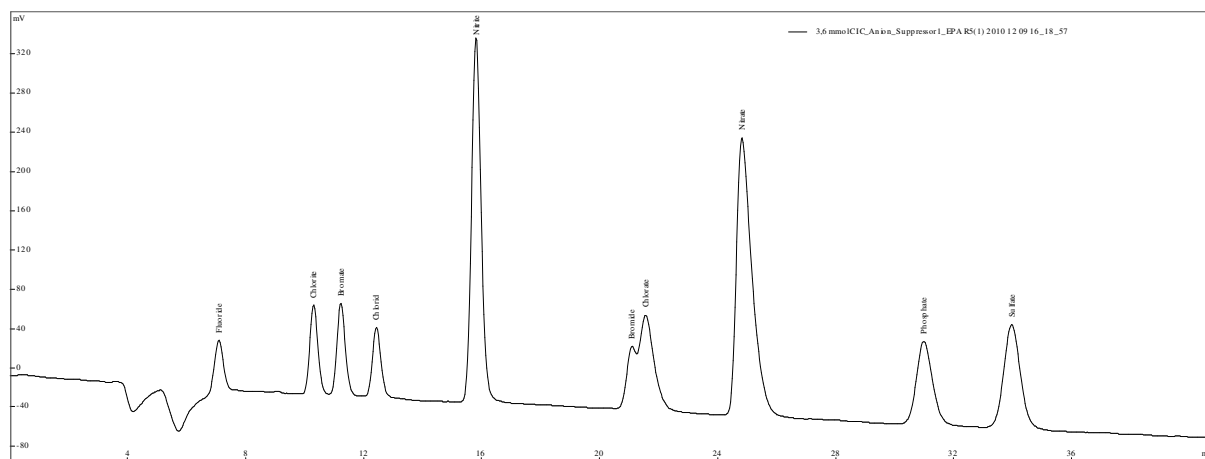
Separation of Standard Solution



Ion Chromatography "EPA 300"

Equipment: IONUS
Column: Metrosep A Supp 7 – 250 mm x 4.0 mm ID Cat. No. 6.1006.630
(Metrohm AG, Switzerland)
Eluent: 3.6 mmol / l Sodium carbonate
Flow: 700 µl/min
Temperature: 45 °C
Detection: Conductivity with Suppressor
Separation of: Fluoride, Chloride, Bromide, Nitrite, Nitrate, Sulfate, Phosphate,
Chlorite, Chlorate and Bromate
Method: EPA 300

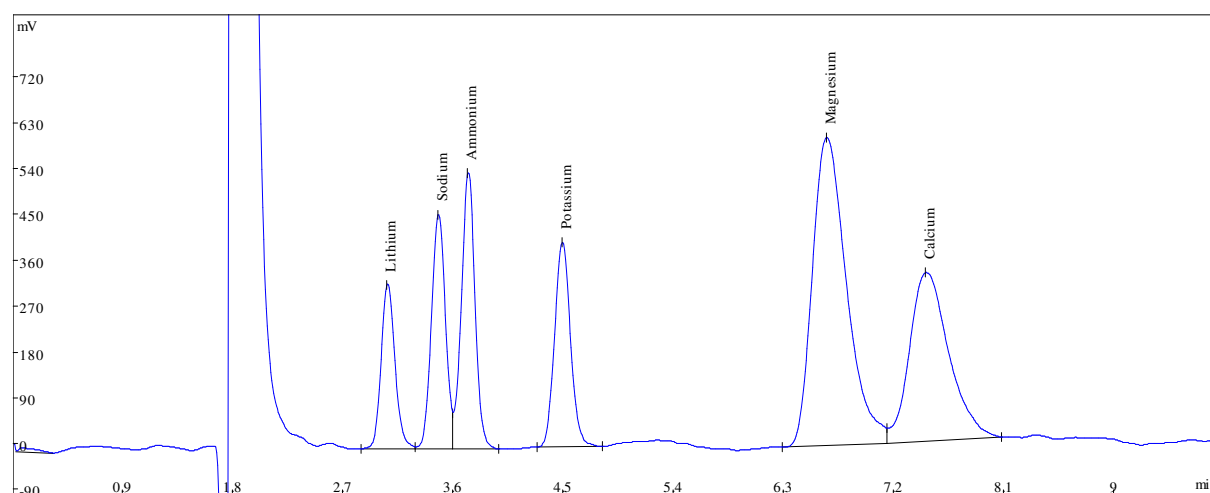
Separation of Standard Solution



Hamilton PRP-X800 – Cations

Equipment : IONUS
 Column : PRP-X800, 7 µm, 250 mm x 4.1 mm ID, P/N 79828, S/N 189
 (Hamilton Company, USA)
 Eluent profile..... : isocratic
 Eluent : 4.25 mM Nitric Acid
 Flow : 1000 µl/min
 Temperature : 30 °C
 Detection : Conductivity
 Injection volume..... : 20 µl
 Sample : Lithium 2 mg/l
 Sodium 10 mg/l
 Ammonium 10 mg/l
 Potassium 20 mg/l
 Calcium 20 mg/l
 Magnesium 20 mg/l

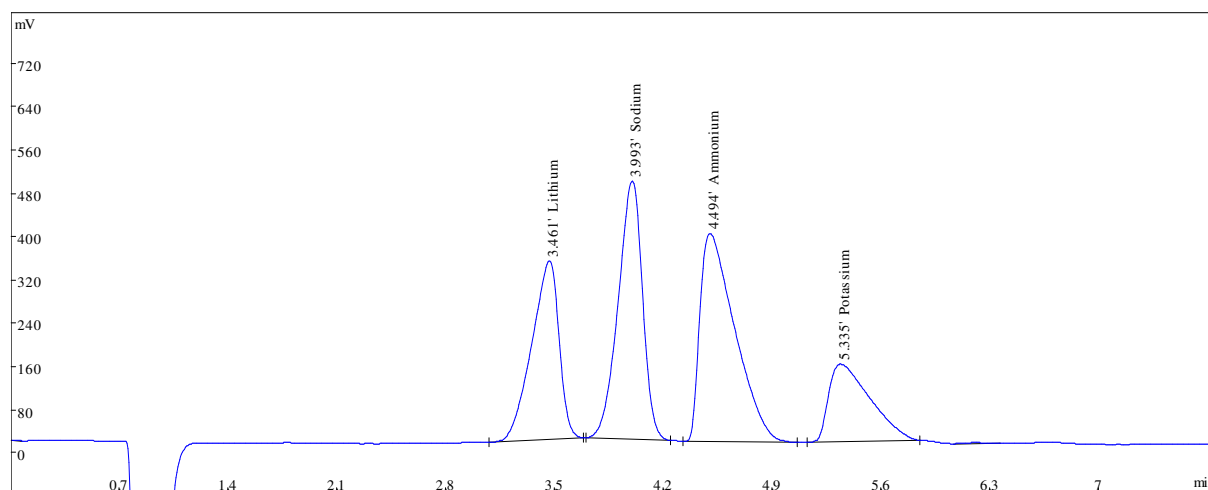
Separation of Standard Solution



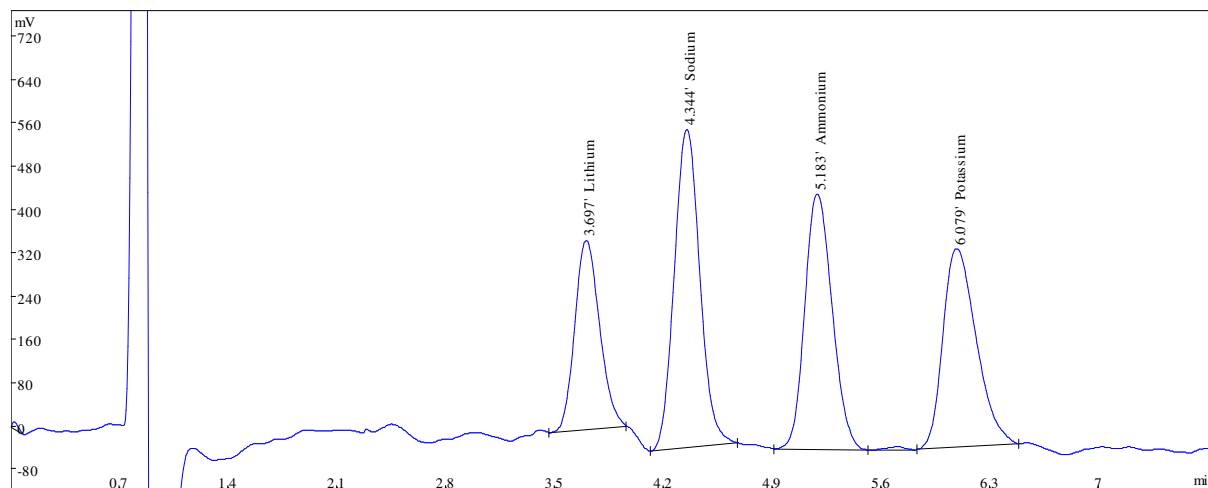
Hamilton PRP-X200 – Alkali Metals

Equipment : IONUS
 Column : PRP-X200, 10 μ m, 100 mm x 4.1 mm ID, P/N 79363, S/N 116
 (Hamilton Company, USA)
 Eluent profile..... : isocratic
 Eluent : 4.0 mM Nitric Acid + Methanol (70 : 30, V/V)
 Flow : 1000 μ l/min
 Temperature : 30 °C
 Detection : Conductivity
 Injection volume..... : 20 μ l
 Sample : Lithium 25 mg/l
 Sodium 100 mg/l
 Ammonium 100 mg/l
 Potassium 100 mg/l

Separation of Standard Solution (Range: 1.0 μ S/cm)



Separation of Standard Solution, Dilution 1 : 4 (Range: 0.1 μ S/cm)



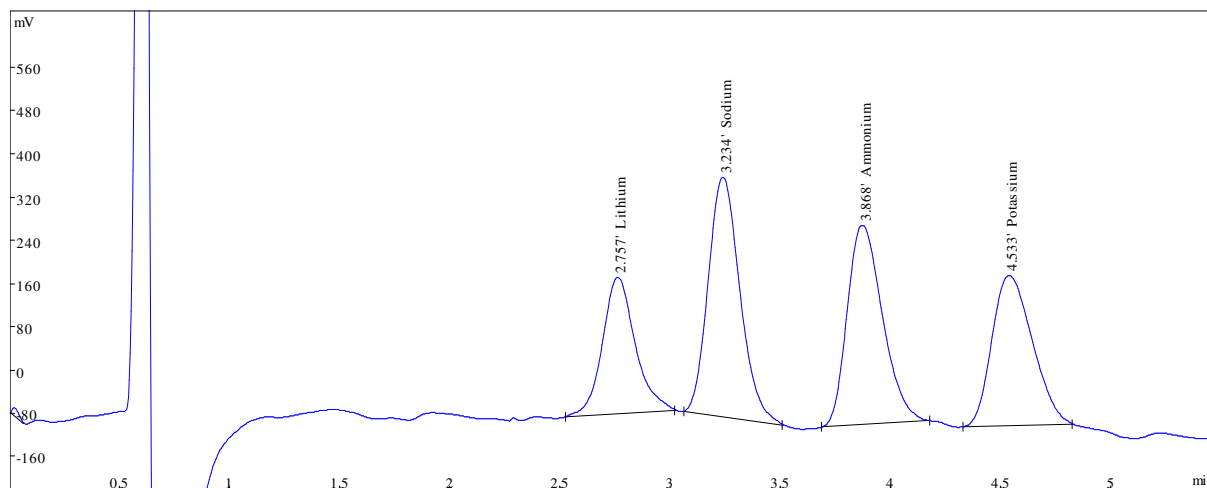
APPLICATION NOTE



Hamilton PRP-X200 – Alkaline Metal - Fast Separation -

Equipment : IONUS
Column : PRP-X200, 10 µm, 100 mm x 4.1 mm ID, P/N 79363, S/N 116
(Hamilton Company, USA)
Eluent profile..... : isocratic
Eluent : 4.0 mM Nitric Acid + Methanol (70 : 30, V/V)
Flow : 1500 µl/min
Temperature : 30 °C
Detection : Conductivity
Injection volume..... : 20 µl
Sample : Lithium 6 mg/l
 Sodium 25 mg/l
 Ammonium 25 mg/l
 Potassium 25 mg/l

Separation of Standard Solution



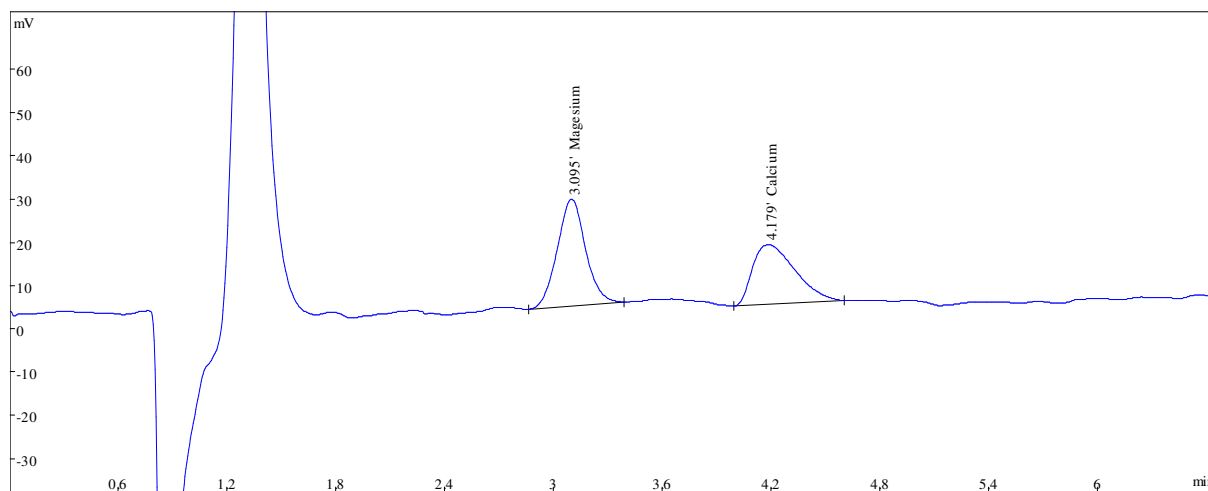
APPLICATION NOTE



Hamilton PRP-X200 – Alkaline Earth Metal

Equipment : IONUS
Column : PRP-X200, 10 μ m, 100 mm x 4.1 mm ID, P/N 79363, S/N 116
(Hamilton Company, USA)
Eluent profile..... : isocratic
Eluent : 4.0 mM Copper Sulfate
Flow : 1000 μ l/min
Temperature : 30 °C
Detection : Conductivity
Injection volume..... : 20 μ l
Sample : Magnesium 100 mg/l
 Calcium 100 mg/l

Separation of Standard Solution



APPLICATION NOTE

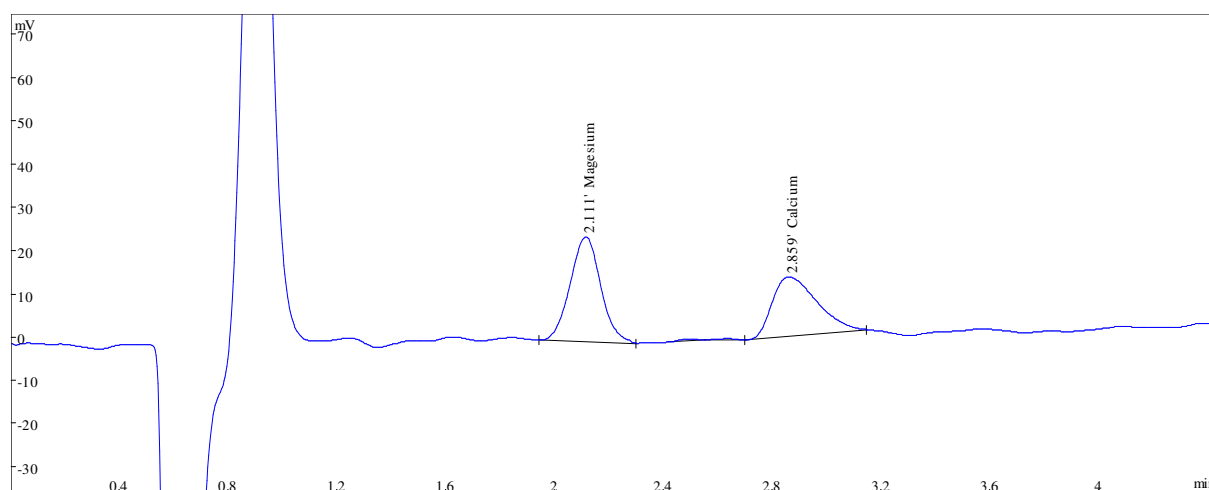


Hamilton PRP-X200 – Alkaline Earth Metal

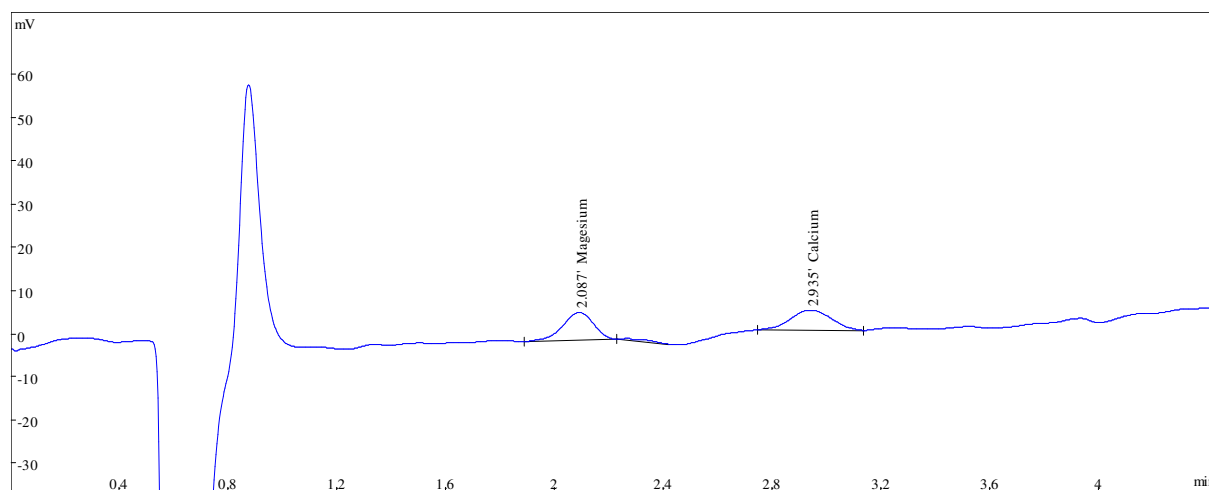
- Fast Separation -

Equipment : IONUS
Column : PRP-X200, 10 μ m, 100 mm x 4.1 mm ID, P/N 79363, S/N 116
(Hamilton Company, USA)
Eluent profile..... : isocratic
Eluent : 4.0 mM Copper Sulfate
Flow : 1500 μ l/min
Temperature : 30 $^{\circ}$ C
Detection : Conductivity
Injection volume..... : 20 μ l
Sample : Magnesium 100 mg/l or 25 mg/l
 Calcium 100 mg/l or 25 mg/l

Separation of Standard Solution (100 mg/l)

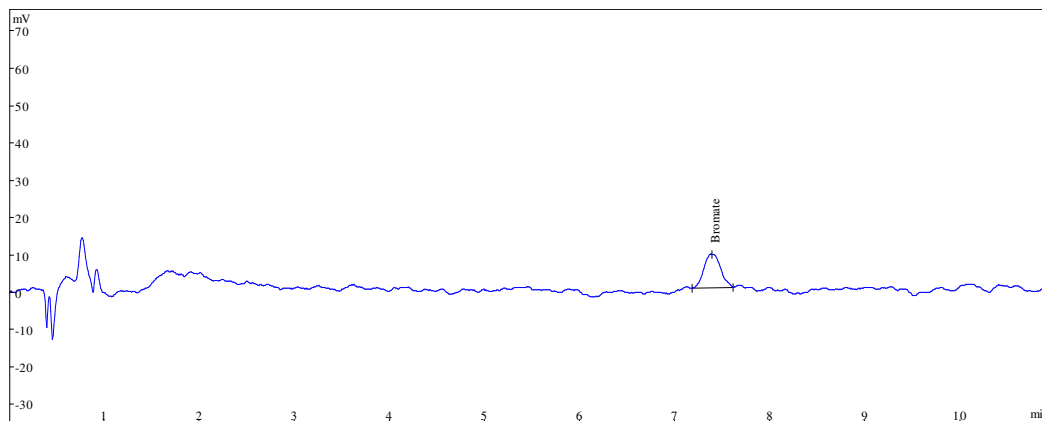
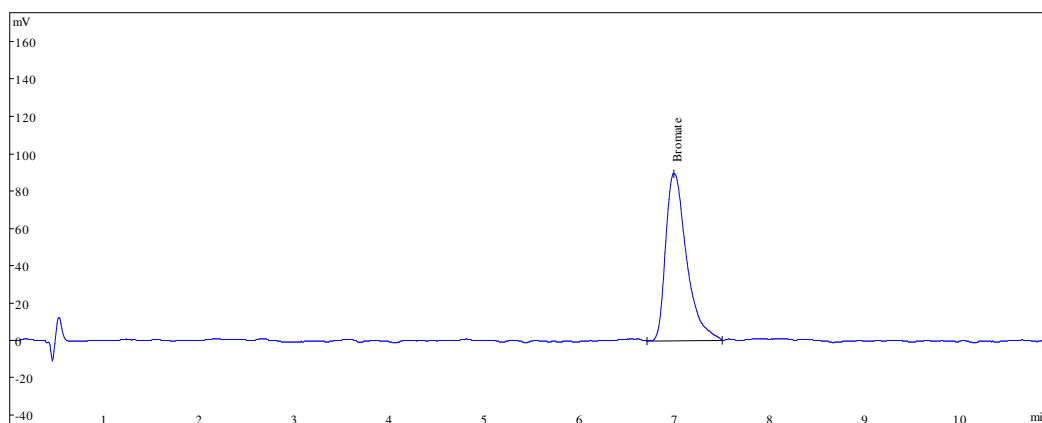


Separation of Standard Solution (25 mg/l)



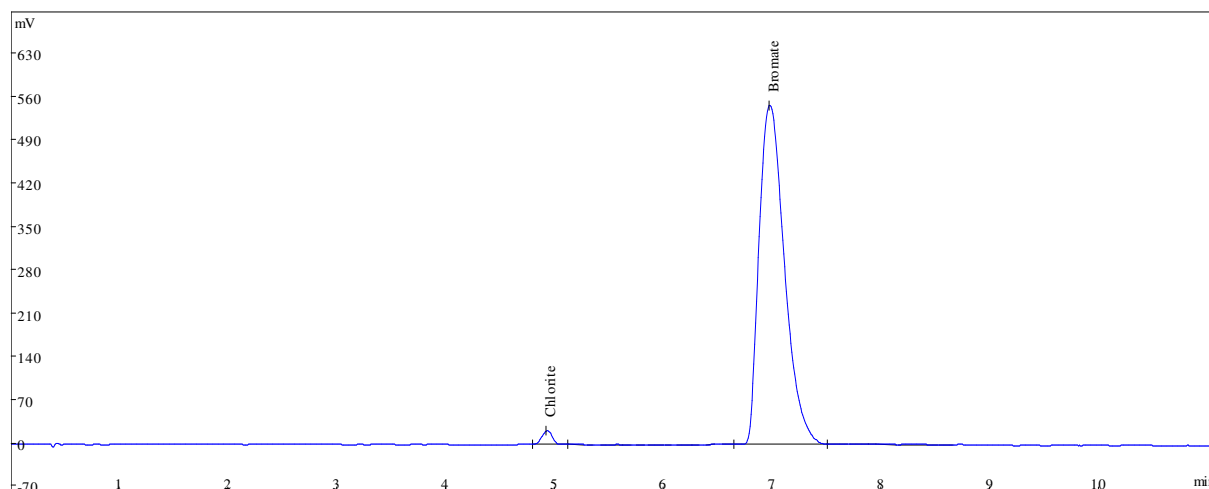
IONUS Bromate – Post-column Derivatization

Equipment	IONUS Bromate, contained a unit for Post-column Derivatization
Column	PRP-X100, 5 μ m, 100 mm x 4.6 mm ID, P/N 79669, S/N 104 (Hamilton Company, USA)
Column temperature	40 °C
Eluent profile.....	isocratic
Eluent	5.0 mM Sodium carbonate 2.5 mM Sodium hydrogen carbonate 0.1 mM Sodium thiocyanate
Reagent.....	500 ml Solution: 250 mg o-Dianisidine in 100 ml Methanol and 2.5 g Potassium bromide in Water with 70 ml 65 % Nitric acid (procedure see next page)
Reactor temperature.....	60 °C
Flow.....	1000 μ l/min
Detection	visible 440 nm
Injection volume.....	500 μ l (manually) or 100 μ l (autosampler)
Samples.....	Bromate standard solutions and Standard for EPA method 317.0 Rev 2.0 (10 Anions)

Separation of Standard Solution 20 ppb (injection volume 500 μ l)**Separation of Standard Solution 500 ppb (injection volume 100 μ l)**



Separation of EPA-Standard Solution (10 Anions, 20 µl injected)



Preparation of Post-column reagent (following EPA 317.0 Rev. 2)

The reagent is prepared by adding 70 mL of 65% nitric acid (purity as 99.999%) to approximately 300 mL ultrapure water in a well rinsed 500 mL volumetric flask and adding 2.5 grams of ACS reagent grade potassium bromide (KBr).

Two-hundred-and-fifty milligrams of purified grade o-dianisidine dihydrochloride salt (ODA) are dissolved, with stirring, in 100 mL methanol (Spectrophotometric grade).

After dissolution, the o-dianisidine solution is added to the nitric acid/KBr solution and diluted to volume with reagent water.

The reagent is stable for 24 hours and should be prepared fresh daily prior to analysis.

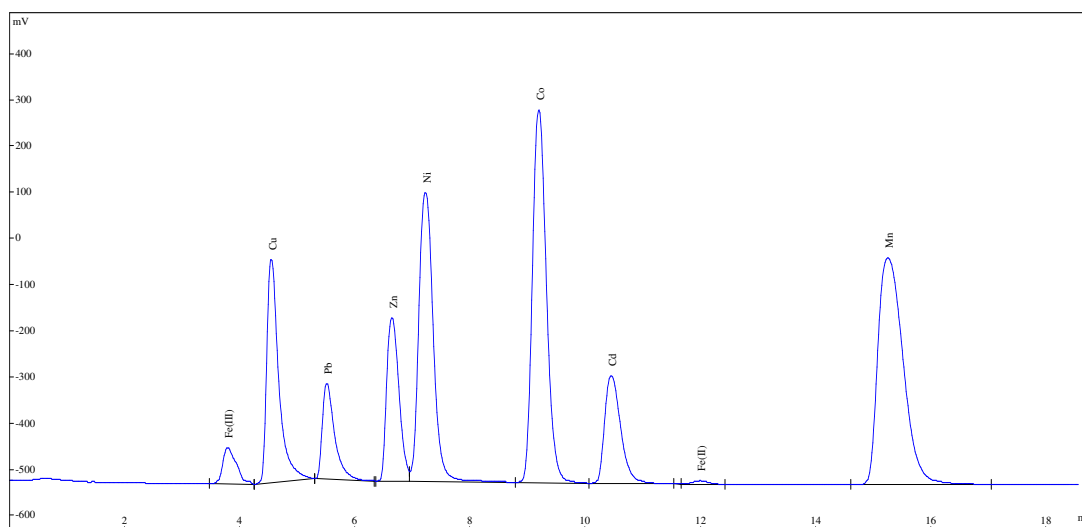
Ion Chromatography of Transition Metals

Equipment	IONUS modified
Column	Nucleosil 100-5 SA, 150 mm x 4.6 mm ID (Fa. Machery-Nagel)
Eluent	0.1 M Tartaric Acid pH 3,0
Flow.....	500 µl/min
Temperature	Room Temperature (25 °C)
Reagent.....	0.2 mM Pyridylazoresorzinol (PAR) in 3 M Ammonium Hydroxide / 1 M Acetic Acid solution
Detection	(U)VIS - 530 nm
Separation of	Iron(III), Iron(II), Copper(II), Lead(II), Zinc(II), Nickel(II), Cobalt(II), Cadmium(II) und Manganese(II)

The contents of trace metals are interesting in tap water and waste water.

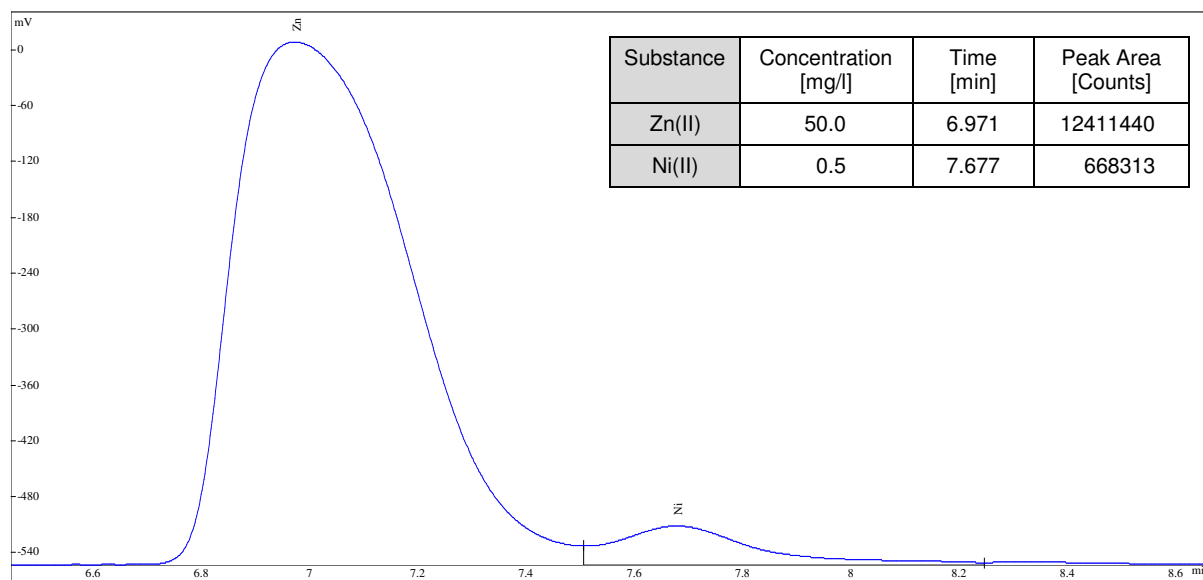
The sensitivity of the determination with post-column derivatization is extremely higher than the conductivity detection.

Separation of Standard Solution

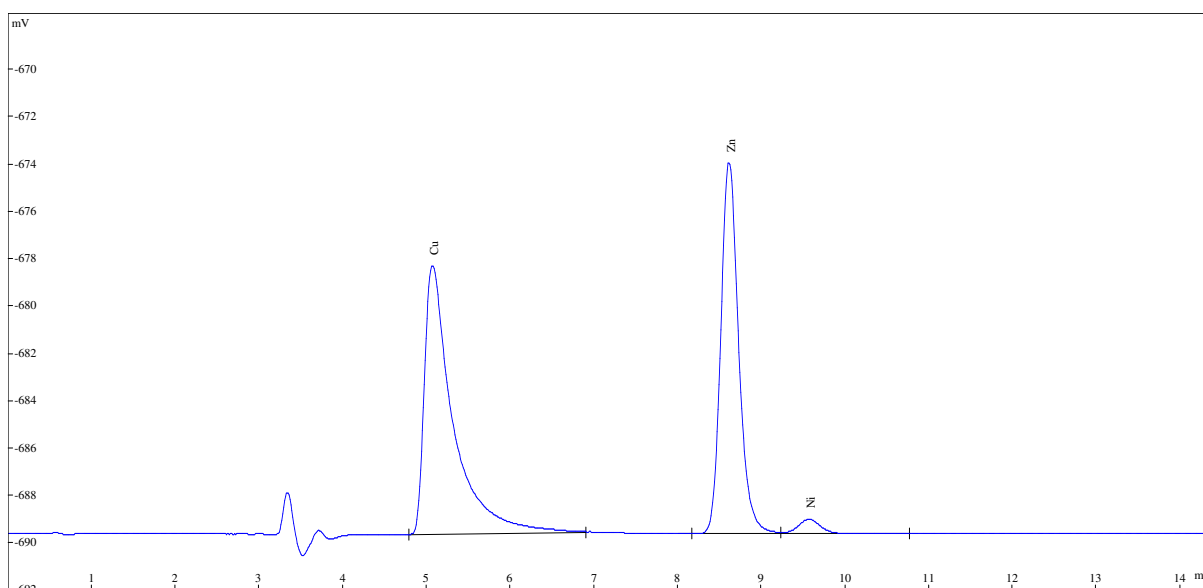


Substance	Concentration [mg/l]	Time [min]	Peak Area [Counts]	Concentration Range [mg/l]
Fe(III)	20	3.783	1292442	2.0 - 20
Cu(II)	10	4.539	6750048	1.0 - 10
Pb(II)	20	5.502	2968347	2.0 - 20
Zn(II)	10	6.633	5069113	0.1 - 10
Ni(II)	10	7.216	10531357	0.1 - 10
Co(II)	10	9.183	13061721	0.1 - 10
Cd(II)	40	10.440	4414797	0.2 - 40
Fe(II)	---	11.980	129761	0.1 - 10
Mn(II)	20	15.242	14795104	0.1 - 20

Separation of Nickel from Zinc



Example: Tap Water from Berlin



Substance	Time [min]	Peak area [Counts]	Concentration [mg/l]
Cu(II)	5.039	244564	1.43
Zn(II)	8.398	206873	0.51
Ni(II)	9.318	15339	0.031

Content of Pb (II) < 0.01 mg/l, Cd(II) < 0.01 mg/l, Co(II) < 1.0 mg/l, Mn(II) < 1.0 mg/l



Rapid & sensitive determination of transition metals!



Ref.: Klingenberg A. and Seubert A., "Comparison of silica-based and polymer-based cation exchangers for the ion chromatographic separation of transition metals", J. Chromatogr. **640** (1993) 167-178

SPACE FOR YOUR IDEAS:





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