The column program

The whole world of ion chromatography

Metrohm

Metrohm – the comprehensive solution

Metrohm has become a synonym for ion chromatography. For more than 35 years, Metrohm has been offering innovative and creative solutions in the area of IC separation columns and IC devices.

Welcome to the world of ion chromatography

With high-tech, long years of application know-how, Swiss quality standards and a reasonable pricing policy, for procurement as well as for maintenance, Metrohm guarantees the optimum solution in ion chromatography.

Welcome to Metrohm!

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Separation columns from Metrohm

Separation columns from Metrohm are the backbone of high-performance analytics in ion chromatography. The combination of Metrohm IC separation columns and Metrohm IC systems guarantees:

- High separating efficiency
- Short analysis times
- Excellent reproducibility
- Long lifetime
- Low costs

Metrohm offers the right separation columns for all disciplines in ion chromatography:

- Anions with or without suppression
- Organic acids
- Cations with or without suppression
- Transition metals
- Carbohydrates
- Amines
- Amino acids

A small number of separation columns are sufficient for solving the majority of application problems. Metrohm offers the correct column material, both for standard applications and for complex separation tasks:

- Poly(styrene-co-divinylbenzene)
- Polyvinyl alcohol
- Polymethacrylate
- Silica gel
- Monolith

This flexibility guarantees top performance. The 2 mm columns enable reduced eluent consumption, low detection limits, and universal use.

Ion chromatography with Metrohm systems can be carried out with or without chemical suppression. Therefore, the application determines the pH value and not the other way around. A large selection of anion eluents is thus available:

- Phthalate
- Benzoate
- Borate
- Hydrogen carbonate
- Carbonate
- Hydroxide

Metrohm is the comprehensive solution for applications in ion chromatography. For more than 35 years, Metrohm has been offering innovative and creative solutions in the area of IC separation columns and IC instruments. A comprehensive network of application laboratories is available worldwide to provide the correct answers to analytical questions: on-site, quickly, and focused on the customer. The Metrohm website (www.metrohm.com) provides an extensive database with information and problem solutions for all areas of ion analysis.

Metrohm – the whole world of ion chromatography

iColumn

The world's first intelligent column generation in ion chromatography – just click and start

- All column data available immediately
- Active monitoring of all important column functions
- Uninterrupted retraceability of all column parameters

Intelligent columns, built into all Metrohm IC instruments – the MagIC Net software registers immediately which separation columns are available to the IC system. One click, and the software detects typical standard conditions for columns such as standard eluents and flow rate, the permissible maximum values for pressure and flow, and the correct guard column. This data and other information are applied in the method if desired. As a result, it is no longer necessary to enter all of this data into the method. The iColumn knows how many hours it has already been in operation and how many samples it has already analyzed. MagIC Net monitors the separating efficiency of the column and switches the system off in the event that the permissible pressure is exceeded. If the performance of the column falls below a previously defined value, then MagIC Net can even have the column reordered automatically by E-mail.

If the Metrosep separation column is used in different systems, then it will take along all information stored on its memory chip to the next IC system. This allows for uninterrupted traceability and GLP monitoring, even on different IC devices, for all columns used. System validation is simplified significantly.

The iColumn concept is flexible and encompasses the following data types:

- Freely definable data, e.g.
  - Column name
  - Comment field in which, for example, the name of the application can be entered
- Data permanently linked with the column, e.g.
  - Column type (e.g. Metrosep A Supp 10 - 100/4.0)
  - Order number
  - Serial number
  - Standard flow
  - Standard eluent
  - Standard injection volume
  - Standard temperature
  - Length x inner diameter
  - Particle size
  - pH range
  - Maximum permitted pressure
  - Maximum permitted flow rate
- Data entered by the IC system and the MagIC Net software, e.g.
  - Operating hours
  - Number of injections
  - Maximum pressure
  - Maximum flow used

All Metrosep separation columns are available exclusively as iColumns. Excluded from this are the other column types, i.e. guard, preconcentration, and trap columns as well as separation columns which do not have the Metrosep designation.

Which column for which application?

Find the column finder online under **https://www.metrohm.com/products/accessories/column-finder.html**

Preselection

Anions	Anions	High concentration Simple setup HBO_3^{2-} $H_2SiO_4^{2-}$ no HPO_4^{2-}	without suppression	→ A
		Entire concentration spectrum	with suppression	→ B
	Oxidizable anions	Amperometric detection		→ C
Cations			without suppression	→ D
			with suppression	→ E
Additional analytes	Organic acids		with or without suppression	→ F
	Carbohydrates	Amperometric detection		→ G
	Amino acids	Post-column reaction with ninhydrin		→ H

This symbol indicates the respective standard column √

A) Anions without chemical suppression

Requirements or application	Column	Page
No F^-	IC anion column	
Simple separation problems	Metrosep A Supp 4 - 250/x.0	
Simple matrices	**6.1006.430 (250/4.0)**	**√ 42**
Rapid separation	**6.01021.230 (250/2.0)**	**√ 100**
Cl^-, NO_3^-, SO_4^{2-}	IC anion columns	
Difficult matrices (e.g. dyes)	Hamilton PRP-X100	
HBO_3^{2-}, $H_2SiO_4^{2-}$	6.1005.000 (125/4.0)	32
	6.1005.010 (250/4.0)	34
No F^-, acetate	IC anion column	
Difficult matrices	Super-Sep - 100/4.6	
Special applications (e.g. BF_4^-)	6.1009.000	36

B) Anions with chemical suppression

Requirements or application	Column	Page
Perchlorate in difficult matrices, EPA 314	IC anion column (Monolith)	
Very high ionic strength	Metrosep Dual 4 - 100/4.6	
	6.1016.030	40
Great differences in concentration	IC anion column	
High ionic strength	Metrosep A Supp 1 - 250/4.6	
ClO_2^-, ClO_3^-, ClO_4^-, BrO_3^-	6.1005.300	46
SCN^-, SO_3^{2-}, SO_4^{2-}, $S_2O_3^{2-}$	IC anion column	
Polyphosphates	Metrosep A Supp 3 - 250/4.6	
	6.1005.320	50
Standard anions	IC anion column	
Difficult matrices	Metrosep A Supp 4 - 250/x.0	
Critical samples	**6.1006.430 (250/4.0)**	**√ 42**
I^-	6.01021.230 (250/2.0)	100
Standard anions	IC anion columns	
F^-, Cl^-, Br^-, I^-	Metrosep A Supp 5	
ClO_2^-, ClO_3^-, ClO_4^-, BrO_3^-	6.1006.550 (50/4.0)	52
BrO_3^- at high ionic strength	6.1006.510 (100/4.0)	54
Cr(VI) (CrO_4^{2-})	6.1006.520 (150/4.0)	56
I^- (not with 250 mm)	6.1006.530 (250/4.0)	58
Method development	6.1006.220 (150/2.0)	102
Universal applications	6.1006.230 (250/2.0)	104
Difficult matrices	Metrosep A Supp 19	
Difficult separation problems	6.01034.410 (100/4.0)	88
Rapid separation (with 50 and 100 mm)	**6.01034.420 (150/4.0)**	**√ 90**
PO_4^{3-} in soft drinks (with 100 mm)	6.01034.430 (250/4.0)	92
IC-MS coupling		
Applications with gradient		
Standard anions	IC anion columns	
Oxyhalides, EPA 300 A+B (with 250 mm)	Metrosep A Supp 7	
Isocratic separation of glycolate and acetate	6.1006.620 (150/4.0)	60
Difficult separations	6.1006.630 (250/4.0)	62
Bayer liquors	6.1006.640 (150/2.0)	106
Applications with gradient	6.1006.650 (250/2.0)	108
	Metrosep A Supp 21	
	6.01036.420 (150/4.0)	94
	6.01036.430 (250/4.0)	**√ 96**

Requirements or application	Column	Page
Anions in salt solutions	Metrosep Carb 2 - 100/x.0	
	6.1090.410 (100/4.0)	136
	6.01090.210 (100/2.0)	146
PO_4^{3-} in soft drinks with cyclamate	IC anion columns	
Standard anions (no F^-)	Metrosep A Supp 10	
SCN^-, SO_3^{2-}, SO_4^{2-}, $S_2O_3^{2-}$	6.1020.050 (50/4.0)	64
Separation SO_3^{2-}, SO_4^{2-}	6.1020.070 (75/4.0)	66
Aerosols with MARS/MARGA (75 mm)	6.1020.010 (100/4.0)	68
Air analytics	6.1020.030 (250/4.0)	70
IC-MS coupling	6.1020.250 (50/2.0)	110
Aggressive matrices	6.1020.270 (75/2.0)	112
	6.1020.210 (100/2.0)	114
	6.1020.220 (150/2.0)	116
	6.1020.230 (250/2.0)	118
Standard anions	IC anion columns	
Universal applications	Metrosep A Supp 16 - 100/x.0	
Non-critical matrices	6.1031.410 (100/4.0)	72
BrO_3^- (EPA 326, DIN EN ISO 11206)	6.1031.210 (100/2.0)	120
IC-MS coupling	Metrosep A Supp 19 - 100/4.0	
	6.01034.410	88
Standard anions	IC anion columns	
Universal applications	Metrosep A Supp 16 - 150/x.0	
Complex matrices	6.1031.420 (150/4.0)	74
IC-MS coupling	6.1031.220 (150/2.0)	122
	Metrosep A Supp 19 - 150/4.0	
	6.01034.420	**√ 90**
Standard anions	IC anion columns	
Universal applications	Metrosep A Supp 16 - 250/x.0	
Oligosaccharides and polysaccharides	6.1031.430 (250/4.0)	76
Cl^-, SO_4^{2-} in electroplating baths	6.1031.230 (250/2.0)	124
Silicate in addition to standard anions (4 mm column)	Metrosep A Supp 19 - 250/4.0	
Quality monitoring of high-purity chemicals	6.01034.430	92
(e.g. conc. acids)		
Complex separation problems		
Difficult matrices		
IC-MS coupling		
Standard anions	IC anion columns	
Water analysis	Metrosep A Supp 17	
Universal applications	6.01032.410 (100/4.0)	78
Complex separation problems	6.01032.420 (150/4.0)	80
Difficult matrices	6.01032.430 (250/4.0)	82
IC-MS coupling	Metrosep A Supp 19	
	6.01034.410 (100/4.0)	88
	6.01034.420 (150/4.0)	**√ 90**
	6.01034.430 (250/4.0	92

C) Oxidizable anions

Requirements or application	Column	Page
CN^- S^{2-}	IC anion column Metrosep A Supp 1 - 250/4.6 6.1005.300	 46
CN^- S^{2-}	IC anion column Metrosep A Supp 10 - 100/x.0 **6.1020.010 (100/4.0)** 6.1020.210 (100/2.0)	 **√ 68** 114
ClO_2^-, NO_2^-, $S_2O_3^{2-}$, SCN^-, I^-	IC anion column Super-Sep - 100/4.6 6.1009.000	 36
NO_2^-, ClO_2^- $S_2O_3^{2-}$, SCN^-, I^-	IC anion column Metrosep A Supp 5 - 100/4.0 6.1006.510	 54

D) Cations without chemical suppression

Requirements or application	Column	Page
Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+ Very rapid separations Simple matrices	IC cation column Metrosep C 4 - 50/4.0 6.1050.450	 166
Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+ Lipophilic amines with short retention times Rapid separations	IC cation columns Metrosep C 4 - 100/x.0 6.1050.410 (100/4.0) 6.1050.210 (100/2.0)	 168 182
Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+ Transition metals Amines	IC cation columns Metrosep C 4 - 150/x.0 6.1050.420 (150/4.0) 6.1050.220 (150/2.0)	 170 184
Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+, Mn^{2+}, Co^{2+}, Ni^{2+}, Zn^{2+}, Cd^{2+}, Pb^{2+}, amines NH_4^+, ethanolamines Na^+/NH_4^+ separation NH_4^+, methylamines, and ethylamines Transition metals Difficult separation problems Great differences in concentration	IC cation columns Metrosep C 4 - 250/x.0 6.1050.430 (250/4.0) 6.1050.230 (250/2.0)	 172 186
Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+ Lipophilic amines with short retention times Rapid separations	IC cation column Metrosep C 6 - 100/x.0 6.1051.410 (100/4.0) 6.01051.210 (100/2.0)	 174 188
Amines Transition metals Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+	IC cation column Metrosep C 6 - 150/x.0 **6.1051.420 (150/4.0)** 6.01051.220 (150/2.0)	 **√ 176** 190
Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+, Co^{2+}, Ni^{2+}, Zn^{2+}, Cd^{2+}, Pb^{2+}, Amine Very good Na^+/NH_4^+ separation NH_4^+, $(CH_3)NH_3^+$, $(CH_3)_2NH_2^+$, $(CH_3)_3NH^+$, $(CH_3)_4N^+$, and the respective ethanolamines Difficult separation problems Great differences in concentration Transition metals	IC cation columns Metrosep C 6 - 250/x.0 6.1051.430 (250/4.0) 6.01051.230 (250/2.0)	 178 192
Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+, Co^{2+}, Ni^{2+}, Zn^{2+}, Cd^{2+}, Pb^{2+}, amines NH_4^+, monoethanolamine Transition metals Na^+/NH_4^+ separation Matrices with high pH	IC cation columns Metrosep C 3 6.1010.410 (100/4.0) 6.1010.420 (150/4.0) 6.1010.430 (250/4.0)	 160 162 164
Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, Fe^{2+}, Co^{2+}, Ni^{2+}, Cd^{2+}, Zn^{2+}, Mn^{2+} Mg^{2+}, Ca^{2+} in addition to large amounts of Na^+	IC cation column Nucleosil 5SA - 125/4.0 6.1007.000	 158
Transition metals, U, and Pu	see footnote on next page	

E) Cations with chemical suppression

Requirements or application	Column	Page
Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+	IC cation columns	
Lipophilic amines with short retention times	Metrosep C Supp 1 - 100/4.0	
Rapid separations	6.1052.410	196
Trace analysis	Metrosep C Supp 2 - 100/4.0	
	6.01053.410	202
Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+	IC cation columns	
Transition metals	Metrosep C Supp 1 - 150/4.0	
Amines	6.1052.420	198
Trace analysis	Metrosep C Supp 2 - 150/4.0	
	6.01053.420	**√ 204**
Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+, Mn^{2+},	IC cation columns	
Co^{2+}, Ni^{2+}, Zn^{2+}, Cd^{2+}, Pb^{2+}, amines	Metrosep C Supp 1 - 250/4.0	
NH_4^+, ethanolamines	6.1052.430	200
Na^+/NH_4^+ separation	Metrosep C Supp 2 - 250/4.0	
NH_4^+, methylamines, and ethylamines	6.01053.430	206
Transition metals		
Difficult separation problems		
Great differences in concentration		
Trace analysis		
Transition metals, U, and Pu	*	

F) Organic acids

Requirements or application	Column	Page
Organic acids: Citrate, tartrate, malate, ascorbate,	IC exclusion columns	
succinate, etc.	Metrosep Organic Acids	
Short-chain fatty acids: Formate, acetate, propionate,	**6.1005.210 (100/7.8)**	**√ 130**
butyrate, etc.	**6.1005.200 (250/7.8)**	**√ 132**
Simple matrices (100 mm)		
Difficult matrices (250 mm)		
Simple separation problems (100 mm)		
Difficult separation problems (250 mm)		
Glycolic acid, monochloroacetic acid	IC exclusion column	
Simple matrices	Hamilton PRP-X300 - 250/4.0	
Simple separation problems	6.1005.030	128
Formate determination		

* Reliable determinations of transition metals as well as uranium and plutonium can be made into the ultra trace range using voltammetry and polarography.

G) Carbohydrates

Requirements or application	Column	Page
Monosaccharides	IC carbohydrate column	
Disaccharides	Metrosep Carb 2 - 100/x.0	
Sugar alcohols	6.1090.410 (100/4.0)	136
Oligosaccharides	6.01090.210 (100/2.0)	146
Simple separation problems		
Very rapid separations		
Monosaccharides	IC carbohydrate column	
Disaccharides	Metrosep Carb 2 - 150/x.0	
Sugar alcohols	**6.1090.420 (150/4.0)**	**√ 138**
Anhydrosugars	6.01090.220 (150/2.0)	148
Oligosaccharides		
Rapid separations		
Monosaccharides	IC carbohydrate column	
Disaccharides	Metrosep Carb 2 - 250/x.0	
Sugar alcohols	6.1090.430 (250/4.0)	140
Anhydrosugars	6.01090.230 (250/2.0)	150
Complex separations		
Monosaccharides	IC carbohydrate column	
Disaccharides	Hamilton RCX-30 - 250/4.6	
Sugar alcohols	6.1018.000	142
Oligosaccharides		
Difficult separation problems		
Difficult matrices		

H) Amino acids

Requirements or application	Column	Page
Amino acids	IC amino acid column	
	Metrosep Amino Acids 1 - 100/4.0	
	6.4001.410	154

Capacity of the separation columns

The capacity of a separation column is determined by the type of the stationary phase used. The capacity has no direct influence on selectivity, whereas the column material does.

In addition, the capacity of a separation column changes in proportion to the quantity of packaging material used. This means that the capacity of a separation column also increases as the column length and diameter increase.

The capacity of separation columns can be determined with a wide variety of methods, all of which can be justified scientifically. The capacities specified here have to do with chloride or potassium exchange capacities, respectively, which are calculated by means of static charging. The specifications of other manufacturers are based to some extent on proton exchange and neutralization methods. The latter results in disproportionately higher numerical values.

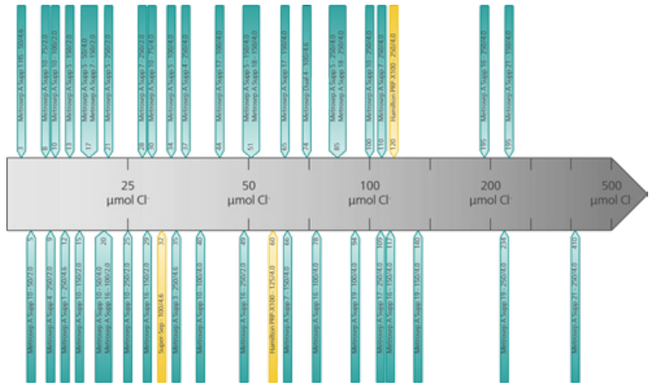
The capacity specifications of a column manufacturer can be used to compare different columns of this manufacturer. Capacity values from different manufacturers that apply different determination methods are not comparable.

Which capacity is right? The following rules apply:

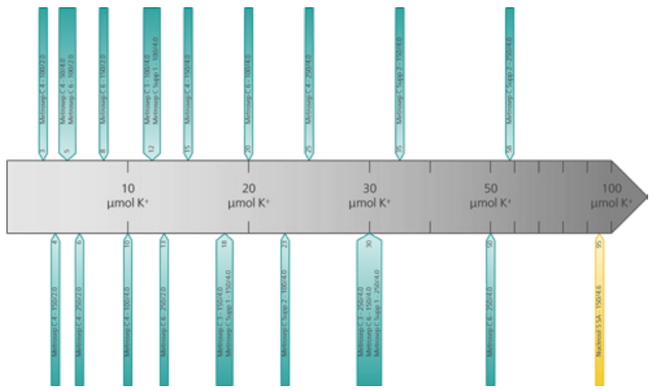
- Simple separation tasks, weakly ionic matrix
  → Small capacity and therefore rapid separation of the analytes
- Complex separation tasks, strongly ionic matrix
  → High capacity and therefore long retention times for the analytes

The practical solution is often to be found somewhere in between. Most separations can thus be solved with just a limited number of column types:

- Determination of anions: Metrosep A Supp 19 - 150/4.0, Metrosep A Supp 5 - 150/4.0, Metrosep A Supp 17 - 150/4.0
- Determination of cations: Metrosep C 6 - 150/4.0



Capacities of the Metrohm anion columns

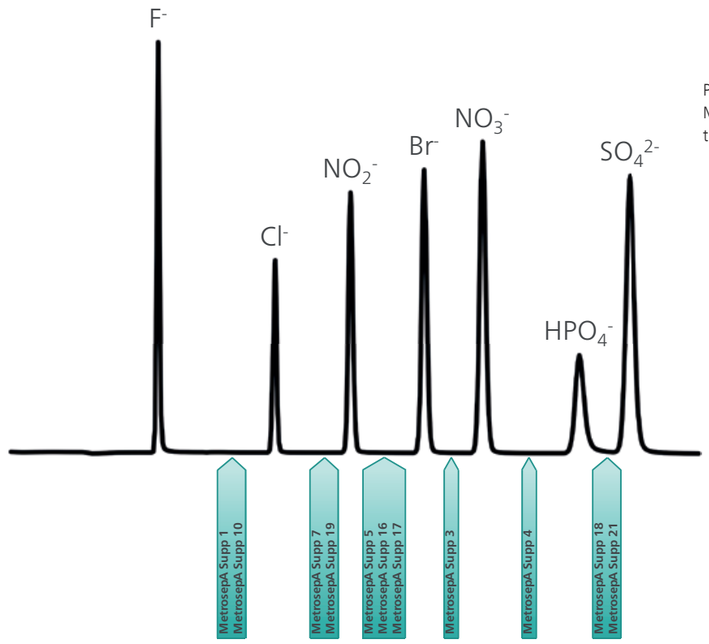


Capacities of the Metrohm cation columns

Position of the system peak

When work is performed with carbonate or hydroxide eluents, a system peak is always present. Its size and position are determined by various factors. The position of the system peak, however, corresponds in the first approximation to the retention time of carbonate. For this reason this peak is also called the system peak. To ensure that the measured values are not skewed, it is important to know the position of the system peak in the chromatogram. With columns based on Poly(styrene-co-divinylbenzene) in particular the system peak often lies directly beneath the chloride peak. The position of the system peak with the respective standard carbonate eluents is shown below.

If the CO_2 suppressor MCS is used, then the influence of carbonate can be virtually excluded. Both system peak and injection peak are minimized and do not interfere with the integration.



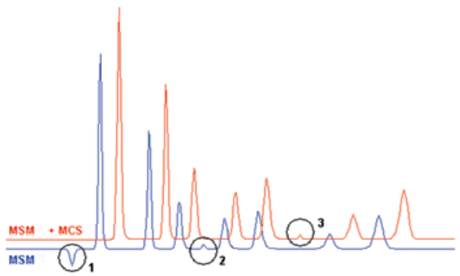
Position of the system peaks on Metrohm anion columns using the respective standard eluent.

MCS Metrohm CO_2 Suppressor

The MCS eliminates both carbonate from the sample and CO_2 that develops during the suppression reaction. As a result, the injection peak is practically nonexistent and the peak areas of the analyte ions are significantly larger. In addition, the system peak is effectively eliminated. The MCS is based on the gas permeability of a fluoropolymer membrane. The special system setup with an integrated vacuum cell, a fluoropolymer membrane, and a CO_2 adsorber cartridge is controlled by MagIC Net.

Chromatography the way it should always be

- Extremely low background conductivity
- Very small injection peak (1)
- Larger peak areas
- Lower detection limits (3)
- Minimized carbonate influence (2)
- No system peak (2)

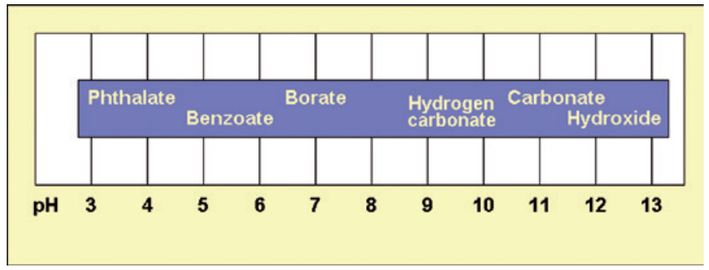


Chromatography with (red) and without sequential suppression (blue)

A unique feature of Metrohm IC is the combination of chemical suppression with the MSM (Metrohm Suppressor Module) and CO_2-suppression using the MCS (Metrohm CO_2 Suppressor) for sequential suppression. This technique achieves lowest background conductivities for anion and cation suppression.

Flexibility in application thanks to free selection of the pH value

Metrohm enables successful working with a large number of eluents. The correct choice of eluent has a decisive influence on the analytics. With Metrohm, there are no limitations and you can use virtually the entire pH range to obtain an optimum separation.



pH ranges of various eluents for anion chromatography

Standards

The world of standards is also changing. Today it is the result that matters when it comes to compliance with standards. Which instrument was used to calculate the result is of secondary importance. This was not always the case. The fact that today you have a free choice of analytical instruments is in part due to the commitment of Metrohm application chemists, who have demonstrated to standards committees that new methods can also produce the correct result and therefore meet requirements.

The following standards deal with the determination of anions and cations in water using ion chromatography. The analytical requirements of these standards can be met with Metrohm IC systems. The separation columns with which the standard can be fulfilled are indicated in brackets.

EPA 300.1 Part A and Part B

Determination of inorganic anions in drinking water by ion chromatography. (Metrosep A Supp 7 - 250/4.0; 6.1006.630 or Metrosep A Supp 21 - 250/4.0; 6.01034.430)

EPA 314.0

Determination of perchlorate in drinking water by ion chromatography. (Metrosep Dual 4 - 100/4.6; 6.1016.030)

EPA 218.7

Determination of dissolved hexavalent chromium by means of ion chromatography (post-column reaction and VIS detection). (Metrosep A Supp 5 - 150/4.0; 6.1006.520)

EPA 317.0

Determination of inorganic oxyhalide disinfection by-products in drinking water using ion chromatography. Trace analysis of bromate by means of post-column reaction – «o-dianisidine method». (Metrosep A Supp 5 - 250/4.0; 6.1006.530)

EPA 326, DIN EN ISO 11206

Determination of inorganic oxidation by-products in drinking water using ion chromatography. Trace analysis of bromate by means of post-column reaction and UV detection – «triiodide» method. Improved method without acidification using a suppressor. (Metrosep A Supp 16 - 100/4.0; 6.1031.410 or Metrosep A Supp 19 - 100/4.0; 6.01034.410)

EPA 332.0

Determination of perchlorate in drinking water by ion chromatography with chemical suppression as well as conductivity detection and ESI/MS detection. (Metrosep A Supp 5 - 100/4.0; 6.1006.510)

DIN 38413-8

Determination of the dissolved complexing agents nitrilotriacetic acid (NTA), ethylenediaminetetraacetic acid (EDTA), and diethylenetriaminepentaacetic acid (DTPA) by liquid chromatography (LC). (2 x MetroSil RP 3 - 150/4.0; 6.01070.420)

DIN EN ISO 14911

Water quality – Determination of dissolved lithium, sodium, ammonium, potassium, manganese(II), calcium, magnesium, strontium, and barium using ion chromatography – Method for water and wastewater. (Metrosep C 4 - 150/4.0; 6.1050.420 or Metrosep C 6 - 150/4.0; 6.1051.420)

DIN EN 13368-1

Determination of chelating agents in fertilizers by ion chromatography, Part 1: HEDTA, EDTA, DTPA. (Metrosep A Supp 3 - 250/4.6; 6.1005.320)

DIN 38405-7

Determination of cyanides in slightly polluted water by ion chromatography or potentiometric titration (Metrosep A Supp 10 - 100/2.0; 6.1020.210)

DIN EN ISO 10304-1

Water quality – Determination of the dissolved anions fluoride, chloride, nitrite, orthophosphate, bromide, nitrate, and sulfate by liquid chromatography – Part 1: Method for slightly polluted wastewater. (Metrosep A Supp 19 - 150/4.0 or Metrosep A Supp 5 - 250/4.0; 6.1006.530)

DIN EN ISO 10304-3

Water quality – determination of dissolved anions by liquid chromatography (LC) – Part 3: Determination of chromate, iodide, sulfite, thiocyanate, and thiososulfate in wastewater. (Metrosep A Supp 17 - 150/4.0; 6.01032.420 or Metrosep A Supp 5 - 150/4.0; 6.1006.520)

DIN EN ISO 10304-4

Water quality – Determination of dissolved anions by liquid chromatography (LC) – Part 4: Determination of chlorate, chloride, and chlorite in slightly polluted wastewater. (Metrosep A Supp 5 - 250; 6.1006.530)

DIN EN ISO 15061

Determination of dissolved bromate in water. (Metrosep A Supp 5 - 250/4.0; 6.1006.530 or Metrosep A Supp 7 - 250/4.0; 6.1006.630)

ABC of practical work

Bacterial growth

Bacterial growth has a significant negative effect on chromatography and destroys the analytical columns. A large number of chromatographic problems can be traced back to the growth of algae, bacteria, and molds. In order to prevent bacterial growth, eluents, rinsing, and regeneration solutions should always be prepared fresh and not reused after prolonged periods. We recommend that all vessels be thoroughly rinsed with ultrapure and UV-treated water and then rinsed with methanol/water or acetone/water and finally again with water before being refilled. If bacteria or algae should form despite this treatment, then 5% methanol or acetone can be added to the eluent. This is not possible when using membrane suppressors, because these could be destroyed by organic solvents. The «MSM», «MSM-HC», and «MSM-LC» Metrohm Suppressor Modules are 100% solvent-resistant. Methanol should not be used with some cation columns.

Cation analyses

For all analyses we recommend that the samples be acidified with nitric acid (approximately 100 µL 2 mol/L HNO_3 per 100 mL of sample) (pH 2.5–3.5), otherwise divalent cation results may be overestimated depending on the age of the injection loop.

Chemical stress

Although many separation phases cover a wide pH range in terms of specification, this does not mean that they are chemically inert. Separation columns achieve their longest service life under constant chemical conditions. A column must never be allowed to dry out and must always be kept well-sealed.

CO_2

Carbon dioxide from air affects alkaline eluents. To avoid this, the eluent bottle should always be furnished with a CO_2 adsorber material («soda lime»). Eluents with a weak buffer capacity must also be protected against CO_2.

Degassing the eluent

In order to prevent bubble formation, we recommended to use the Eluent Degasser in the IC instrument. Alternatively this is done by applying a vacuum created by a water-jet pump or vacuum pump for approximately 10 minutes or by means of an ultrasonic bath.

Eluent bottles

Eluents are positioned in special eluent bottles, usually directly on the IC system. To prevent moisture and carbon dioxide from being absorbed by the eluent, the bottles are equipped with a drying tube which normally has a molecular sieve and is filled with soda lime (as a weak CO_2 adsorber material) for sodium hydroxide and carbonate eluents.

Environmental protection

A great advantage of ion chromatography is that most work is carried out with aqueous media. The chemicals used in ion chromatography are therefore as non-toxic as possible and do not pollute the environment. Nevertheless, when work is carried out with acids, bases, organic solvents, or heavy metal standards, they must be disposed of properly after use.

Filter

If problems occur with IC systems, they are usually due to particles introduced by bacterial growth, unfiltered eluents, by the sample or by rinsing and regeneration solutions. This risk can be reduced to an absolute minimum by using an aspiration filter (6.2821.090), inline filter (6.2821.120), and guard columns. The filters are part of the basic equipment of the Metrohm ion chromatographs and are included in the scope of delivery. We strongly recommend their use. Care should be taken to ensure that the filters are replaced regularly.

Filtration of the eluent

All eluents should be microfiltered (0.45 µm) immediately before being used.

Fun

Ion chromatography should be fun and not get on your nerves. Metrohm does everything it can to ensure that your IC systems work reliably with a minimum of upkeep, maintenance, and cost. Metrosep separation columns stand for quality, long lifetime, and outstanding results.

Guard columns (precolumns)

Guard columns are used to protect the valuable separation columns. We strongly recommend their use. They contain the same stationary phase as the separation column, although in a considerably smaller quantity to avoid influencing the chromatography. Guard columns eliminate critical contaminations which might react with the column material and they effectively eliminate particles and bacterial contamination. Guard columns need to be replaced if

- the backpressure in the system rises
- the chromatograohy gets worse

It is recommended to use 3–4 guard columns during the lifetime of an analytical column. Guard columns are available for all Metrosep separation columns.

Long-term storage of the ion chromatograph

If the ion chromatograph will not be used for a prolonged period (>1 week), then the separation column should be removed and sealed with the stoppers provided. The ion chromatograph should be rinsed with methanol/water (1:4). Care should be taken to ensure that all three chambers of the suppressor are rinsed during this process. The separation column should be stored in the medium listed on the column leaflet, optimally between 4 and 8 °C. When the instrument is restarted, rinse the system with fresh eluent before installing the separation column and bring it up to room temperature.

Particles

All solutions, samples, regeneration solutions, the water and the eluents should be free of particles because they may clog the separation columns over time (increase in column pressure). This must be taken into account particularly when eluents are being produced, because eluents flow continuously through the column (500–1000 mL per working day in contrast to approximately 1 mL of sample solution). The sample can be filtered or dialyzed fully automatically with the «MISP» Metrohm Inline Sample Preparation systems.

Pulsation absorber

We recommend the use of a pulsation absorber (6.2620.150). In particular, polymethacrylate and polyvinyl alcohol columns should be protected against brief pressure surges which inevitably occur when the valves are switched. This protection is ensured when a pulsation absorber is used.

Quality of chemicals

All chemicals should be at least of p.a. or puriss. quality. The standards must be specially suited to ion chromatography.

Regeneration of separation columns

As a rule, if separation columns are operated with clean eluents and charged with particle-free samples, then a very long lifetime is guaranteed. A regeneration of the column is then not necessary and is also no longer possible after a large number of injections. Nevertheless, if the pressure in the column should rise unexpectedly or the separating efficiency decrease, then the regeneration steps which are indicated for each separation column can be carried out. In general, it must be noted that the regeneration takes place outside the analytical line. This means that the separation column is connected directly to the pump and the regeneration solution feeds through the column directly into the waste vessel. Before the separation column is reinstalled, it should be rinsed sufficiently – for 30 minutes at standard flow – with fresh eluent.

Sample-preparation cartridges

Sample-preparation cartridges are used for the preparation of critical samples which cannot be injected directly on the separation columns. Thus, for example, sample-preparation cartridges remove organic contamination or neutralize strongly alkaline or acidic samples. Sample-preparation cartridges are consumable materials which, as a rule, cannot be regenerated. They do not replace the guard column (precolumn), which should always be used with each separation column. «MISP» (Metrohm Inline Sample Preparation) offers an alternative to sample cartridges, e.g. for the fully automated neutralization of alkaline samples.

Water quality

Ion chromatography primarily involves work in aqueous media. Water quality is therefore of decisive importance for obtaining good chromatographic results. If the water quality is unsatisfactory, then the results will certainly be unsatisfactory as well. In addition, there is the risk of damaging instruments and separation columns due to insufficient water quality. The ultrapure water used should have a specific resistance greater than 18 MΩ·cm and be particle-free. It is therefore recommended that the water be filtered through a 0.45 µm filter and treated with UV. Modern ultrapure water plants for laboratory use guarantee this water quality (Type I).

Tips for eluent preparation

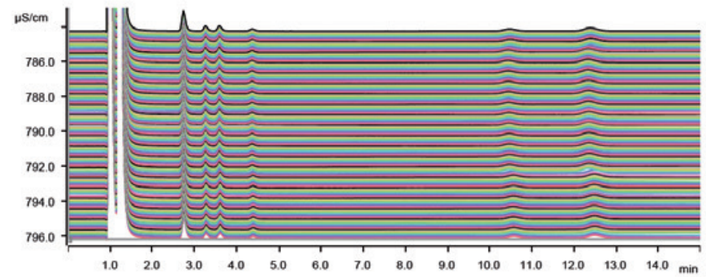
Please note that the eluents must be degassed once in order to avoid bubble formation during the measurements. Degassing can be carried out fully automatically by the eluent degasser in the IC instrument. Alternatively, the ultrapure water used can already be degassed before the reagents are added.
Excellent water quality (high resistance, absence of particles, and bacteria) is crucial for good ion chromatography (see also the chapter «ABCs of practical work».

The exact concentration specifications of the recommended standard eluents are listed in the chapter «Separation columns».

Inline Eluent Preparation
Inline Eluent Preparation means that eluent is refilled fully automatically while the ion chromatograph is in operation. An eluent concentrate is diluted in portions with ultra pure water for the purpose of producing the required eluent.

For automatic Inline Eluent Preparation, the 940 Professional IC Vario or 930 Compact IC Flex only need to be expanded to include an 941 Eluent Production Module.

Tests with repeated injections of 250 µg/L standard solutions over a time period of approximately 20 days have demonstrated outstanding stability with respect to retention times. After more than 800 sample injections, the relative standard deviations for a series of anions and cations were less than 0.55 and 0.41 percent, respectively. During a test sequence over a 24-hour period, the precision of the retention times for anions and cations were better than 0.09 and 0.08 percent, respectively. In short, this increases the reproducibility of retention times, thus permitting the exact analysis of anions and cations over extended periods, and does so without manual eluent production.



Superimposition of 200 sequential cation chromatograms (250 µg/L of the standard cation)

Separation columns

IC anion-separation columns for analyses without chemical suppression

Hamilton PRP-X100 - 125/4.0 (6.1005.000)

The Hamilton PRP-X100 - 125/4.0 IC anion column is a robust separation column based on poly(styrene-co-divinylbenzene) copolymer. It is especially suited for the separation of chloride, nitrate, and sulfate without chemical suppression. Fluoride can also be determined if the cations are first removed with an H^+ cartridge. The Hamilton PRP-X100 - 125/4.0 is also the separation column of choice for the determination of silicate. The column is characterized by a very good price-performance ratio.

Applications

- Cl^-, NO_3^-, SO_4^{2-}
- Difficult matrices, e.g. dyes
- HBO_3^{2-}, $H_2SiO_4^{2-}$

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	125 x 4.0 mm
Column body	Stainless steel
Standard flow	2.0 mL/min
Maximum flow	8.0 mL/min
Maximum pressure	34 MPa
Particle size	10 µm
Organic modifier	0–100%
pH range	1–13 (T > 30 °C: 1–8)
Capacity	60 µmol (Cl^-)

Eluents

Phthalic acid eluent (standard eluent)	Phthalic acid	665 mg/2 L	2.0 mmol/L
	Acetone	152 mL/2 L or 200 mL/2 L	7.6% or 10%
	NaOH		pH = 5
Silicate eluent	Sodium hydroxide (c = 10 mol/L)	0.64 mL/2 L	3.2 mmol/L
	Sodium carbonate	106 mg/2 L	0.5 mmol/L

Care

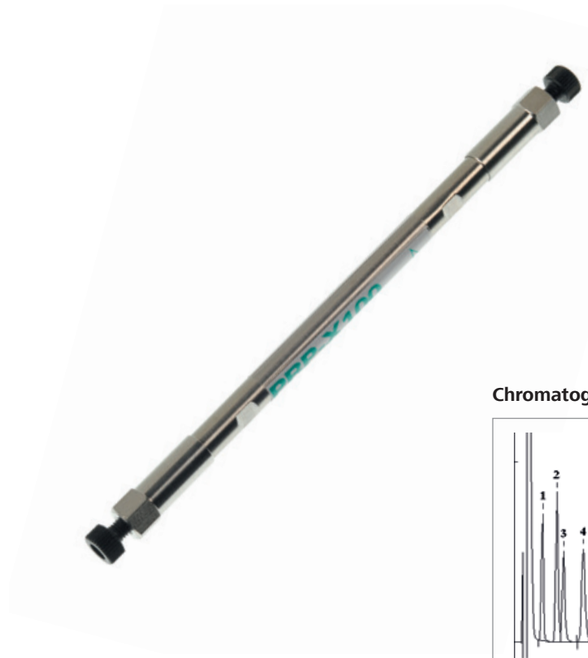
Regeneration

Rinse the column with 0.5 mol/L tartaric acid or with 60 mmol/L nitric acid in methanol at a flow rate of 0.5 mL/min for 2 h.

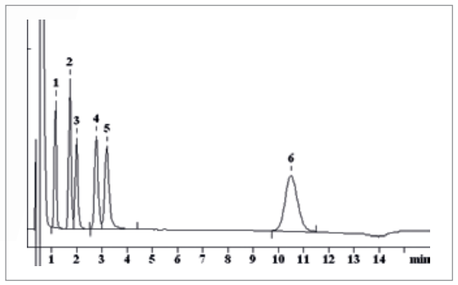
In case of contamination with iron:
Rinse the column overnight with 0.1 mmol/L Na_2H_2EDTA at a flow rate of 0.5 mL/min.

Storage

For short periods (days) in the eluent, for longer periods (weeks) in methanol/water (1:4)

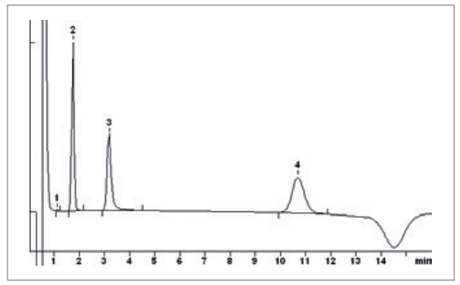


Chromatograms



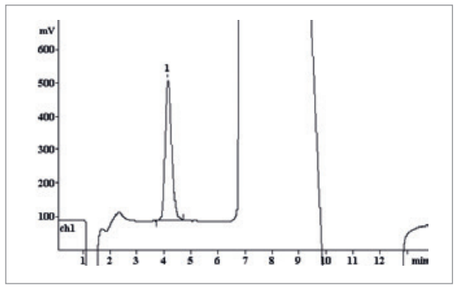
Phthalic acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	5.00	4	Bromide	10.00
2	Chloride	5.00	5	Nitrate	10.00
3	Nitrite	5.00	6	Sulfate	10.00



Phthalic acid eluent, drinking water sample

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	0.04	3	Nitrate	10.13
2	Chloride	6.15	4	Sulfate	7.36



Silicate eluent, standard

		Conc. (mg/L)
1	Silicate	5.00

Ordering information

Hamilton PRP-X100 - 125/4.0	6.1005.000
Guard column cartridge for Hamilton PRP-X100	6.1005.020
Guard cartridge holder, 20 mm	6.02821.000

Hamilton PRP-X100 - 250/4.0 (6.1005.010)

The Hamilton PRP-X100 - 250/4.0 IC anion column is a robust separation column based on poly(styrene-co-divinylbenzene) copolymer. It is mainly used with difficult matrices, e.g. dyes.

Applications

Conductivity detection

- Cl^-, NO_3^-, SO_4^{2-}
- Difficult matrices, e.g. dyes

Technical information

Substrate	Poly(styrene-co-divinylbenzene)with quaternary ammonium groups
Column dimensions	250 x 4.0 mm
Column body	Stainless steel
Standard flow	2.0 mL/min
Maximum flow	8.0 mL/min
Maximum pressure	34 MPa
Particle size	10 µm
Organic modifier	0–100%
pH range	1–13 (T > 30 °C: 1–8)
Capacity	120 µmol (Cl^-)

Eluent

Phthalic acid eluent (standard eluent)	Phthalic acid	665 mg/2 L	2.0 mmol/L
	Acetone	152 mL/2 L or 200 mL/2 L	7.6% or 10%
	NaOH		pH = 5

Care

Regeneration

Rinse the column with 0.5 mol/L tartaric acid or with 60 mmol/L nitric acid in methanol at a flow rate of 0.5 mL/min for 2 h.

In case of contamination with iron:
Rinse the column overnight with 0.1 mmol/L Na_2H_2EDTA at a flow rate of 0.5 mL/min.

Storage

For short periods (days) in the eluent, for longer periods (weeks) in methanol/water (1:4)

Ordering information

Hamilton PRP-X100 - 250/4.0	6.1005.010
Guard column cartridge for Hamilton PRP-X100	6.1005.020
Guard cartridge holder, 20 mm	6.02821.000

Super-Sep - 100/4.6 (6.1009.000)

In addition to the analysis of standard anions without chemical suppression, this column can be used for a variety of special applications. The Super-Sep - 100/4.6 IC anion column can be used for successful phosphate detection with alkaline eluent. Formate, acetate, and fluoride can be separated with suitable eluents. Overall, it is a column with very good separation performance.

Applications

Conductivity detection
- F^-, acetate
- Difficult matrices
- Special applications, e.g. BF_4^-

Amperometric detection
- ClO_2^-, NO_2^-, $S_2O_3^{2-}$, SCN^-, I^-

Technical information

Substrate	Polymethacrylate
Column dimensions	100 x 4.6 mm
Column body	Stainless steel
Standard flow	1.5 mL/min
Maximum flow	2.0 mL/min
Maximum pressure	2.5 MPa
Particle size	12 µm
Organic modifier	0–20%
pH range	1–13
Temperature range	20–50 °C
Capacity	32 µmol (Cl^-)

Eluent

Phthalic acid eluent	Phthalic acid	831 mg/2 L	2.5 mmol/L
(standard eluent)	Acetonitrile	100 mL/2 L	5.0%
	TRIS		pH = 4.0

Care

Regeneration

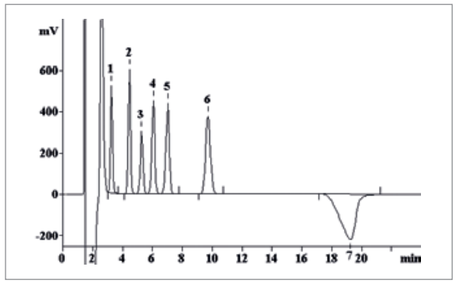
Rinse the column with 20% acetonitrile in 0.1 mol/L nitric acid; flow rate 0.3 mL/min for approx. 24 h.

If insufficient:
- Metal contaminants: 0.1 mol/L sodium tartrate
- Protein contaminants: 0.1 mol/L sodium hydroxide or 20% acetic acid
- Organic contaminants: 20% acetonitrile in ultrapure water

Storage

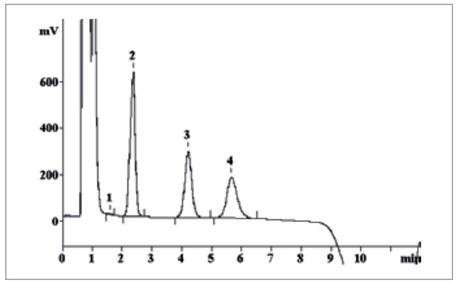
In the eluent

Chromatograms



Phthalic acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	5.00	5	Nitrate	10.00
2	Chloride	5.00	6	Sulfate	10.00
3	Nitrite	5.00	7	System peak	–
4	Bromide	10.00			



Phthalic acid eluent, drinking water sample

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	0.03	4	Sulfate	5.35
2	Chloride	6.43	5	System peak	–
3	Nitrate	7.83			

Ordering information

Super-Sep - 100/4.6	6.1009.000
Super-Sep Guard/4.6	6.1009.010

Separation columns

IC anion-separation columns for analyses with or without chemical suppression

Metrosep Dual 4 - 100/4.6 (6.1016.030)

The Metrosep Dual 4 separation columns are based on a functionalized monolith based on silica gel. The monolith permits an eluent flow of up to 5 mL/min. Despite the high flow, the column is characterized by low backpressure. In contrast to traditional materials, the monolith has a much larger surface due to its structure of macropores and mesopores. This contributes to the high column capacity with simultaneously very low dead volume.

The Metrosep Dual 4 - 100/4.6 is suitable for a great number of applications. All standard anions can thus be separated in less than nine minutes. The high column capacity makes it largely insensitive to matrix influences. Even in a matrix of 3 g/L chloride, carbonate and sulfate, 0.5 µg/L perchlorate can be detected. The column is therefore used in perchlorate analysis in accordance with EPA standard 314.

The column can be used with or without chemical suppression. When p-cyanophenol is used as the eluent, it is recommended that the Metrosep RP Trap 1 - 50/4.0 (6.1014.100) be installed between pulsation absorber and injection valve.

Applications

- Rapid separations
- Complex sample matrices
- EPA 314
- Detection of perchlorate

Technical information

Substrate	Monolithic silica gel
Column dimensions	100 x 4.6 mm
Column body	PEEK
Standard flow	2.0 mL/min
Maximum flow	5.0 mL/min
Maximum pressure	20 MPa
Particle size	Monolith with 2 µm macropores and 13 nm mesopores
Organic modifier	0–5% (methanol or acetonitrile only)
pH range	2–8
Temperature range	10–60 °C
Capacity	74 µmol (Cl^-)

Eluent

p-cyanophenol eluent (standard eluent)	p-cyanophenol KOH	2859 mg/2 L	12.0 mmol/L pH = 7.4 ± 0.1

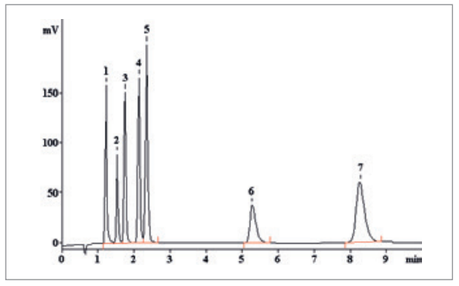
Care

Preparation
Rinse the column with eluent for 0.5–1 h.

Storage
In the eluent

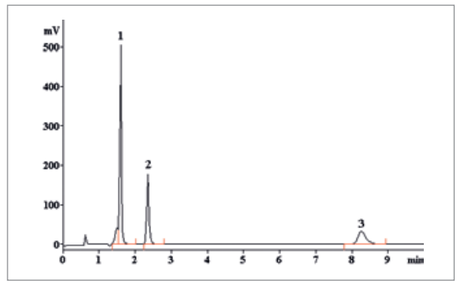
Regeneration
Rinse the column with a maximum of 5% acetonitrile at a flow rate of 0.5 mL/min for 30 min.

Chromatograms



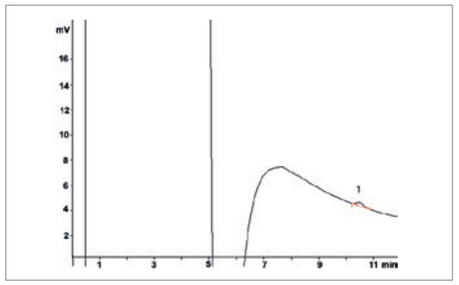
p-cyanophenol eluent, standard — Conc. (mg/L)

1	Fluoride	2.00	5	Nitrate	10.00
2	Chloride	2.00	6	Phosphate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	Bromide	10.00			



p-cyanophenol eluent, drinking water — Conc. (mg/L)

1	Chloride	5.25	3	Sulfate	6.90
2	Nitrate	10.36			



p-cyanophenol eluent, Standard, EPA 314 — Conc. (µg/L)

-	Chloride	1,000,000	1	Perchlorate	0.54
-	Carbonate	1,000,000			
-	Sulfate	1,000,000			

Flow rate 1.75 mL/min
Sample volume 750 µL

Ordering information

Metrosep Dual 4 - 100/4.6	6.1016.030
Guard column kit for the Metrosep Dual 4, comprised of three guard column cartridges and one guard column cartridge holder	6.1016.500
Guard column cartridges for the Metrosep Dual 4 (3 pcs.)	6.1016.510

Metrosep A Supp 4 - 250/4.0 (6.1006.430)

The Metrosep A Supp 4 - 250/4.0 is an extremely robust column with very good separation properties. The separation phase is comprised of polyvinyl alcohol particles with quaternary ammonium groups and a diameter of 9 µm. This structure guarantees great stability and a greater tolerance to very small particles which could pass through the integrated filter plate. The Metrosep A Supp 4 - 250/4.0 has a medium ion-exchange capacity; sulfate elutes after 12.5 minutes. The number of plates which can be achieved with this separation column is high. Therefore the Metrosep A Supp 4 - 250/4.0 is particularly suitable for all routine tasks in water analysis.

To protect the IC separation column – even though it is not particularly sensitive to contaminants – we recommend the use of the Metrosep A Supp 4 Guard/4.0 or the Metrosep A Supp 4 S-Guard/4.0.

Applications

- Standard anions
- Water analysis
- Difficult matrices
- Critical samples
- Iodide

Technical information

Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	2.0 mL/min
Maximum pressure	12 MPa
Particle size	9 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–12
Temperature range	20–60 °C
Capacity	37 µmol (Cl^-)

Eluent

Without chemical suppression			
Phthalic acid eluent	Phthalic acid	1660 mg/2 L	5.0 mmol/L
(standard eluent)	Acetone	40 mL/2 L	2.0%
	TRIS		pH = 4.4
With chemical suppression			
Carbonate eluent	Sodium hydrogen carbonate	286 mg/2 L	1.7 mmol/L
(standard eluent)	Sodium carbonate	382 mg/2 L	1.8 mmol/L
Carbonate eluent, mod.	Sodium hydrogen carbonate	672 mg/2 L	4.0 mmol/L
	Sodium carbonate	212 mg/2 L	1.0 mmol/L

Care

Regeneration

Contamination with hydrophilic ions:

a) Rinse with ultrapure water (15 min at 0.5 mL/min)
b) Rinse with 10x concentrated eluent (60 min at 0.5 mL/min)
c) Rinse with ultrapure water (15 min at 0.5 mL/min)
d) Rinse with eluent (60 min at 0.5 mL/min)

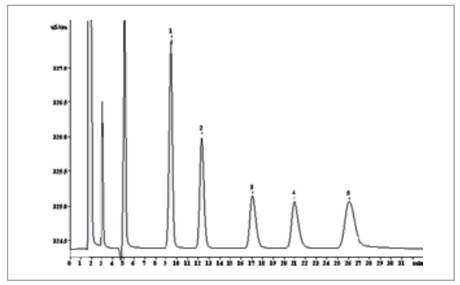
Contamination with lipophilic ions:

a) Rinse with ultrapure water (15 min at 0.5 mL/min)
b) Rinse with 5% acetonitrile (10 min at 0.5 mL/min)
c) Rinse with 100% acetonitrile (60 min at 0.5 mL/min)
d) Rinse with 50% acetonitrile (10 min at 0.5 mL/min)
e) Rinse with ultrapure water (30 min at 0.5 mL/min)
f) Rinse with eluent (60 min at 0.5 mL/min)

Storage

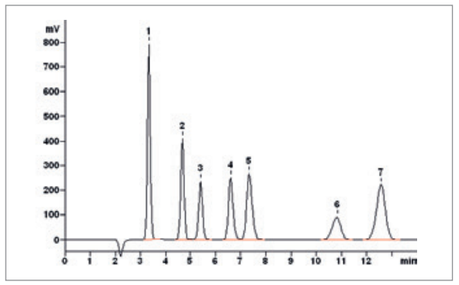
In the eluent

Chromatograms



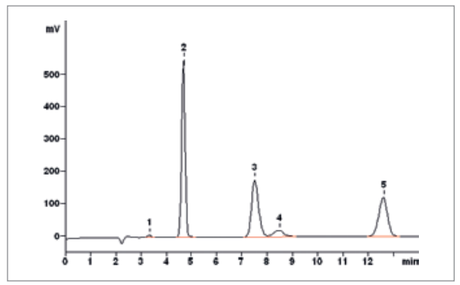
Phthalic acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Chloride	25.0	4	Nitrate	25.0
2	Nitrite	25.0	5	Sulfate	25.0
3	Bromide	25.0			



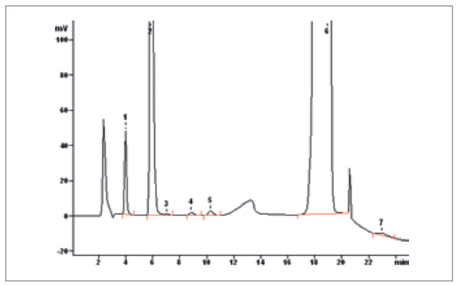
Carbonate eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	5.00	5	Nitrate	10.00
2	Chloride	5.00	6	Phosphate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	Bromide	10.00			



Carbonate eluent, drinking water

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	0.04	4	System peak	–
2	Chloride	5.25	5	Sulfate	6.90
3	Nitrate	10.36			



Carbonate eluent, mod., mineral water

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	0.685	5	Nitrate	0.267
2	Chloride	17.43	6	Sulfate	121.0
3	Nitrite	0.037	7	Iodide	0.034
4	Bromide	0.181			

Ordering information

Metrosep A Supp 4 - 250/4.0	6.1006.430
Metrosep A Supp 4 Guard/4.0	6.01021.500
Metrosep A Supp 4 S-Guard/4.0	6.01021.510

Separation columns

IC anion-separation columns for analyses with chemical suppression

Metrosep A Supp 1 - 250/4.6 (6.1005.300)

The Metrosep A Supp 1 - 250/4.6 is a universal anion column which is characterized by medium capacity and special selectivity. With this column it is possible to process samples with great differences in concentration. For example, 4 µg/L of sulfate can be determined in a solution containing 150 g/L sodium chloride. An additional advantage is that bromide elutes after nitrate. Particularly in the area of oxyhalide analysis, the A Supp 1 - 250/4.6 excels in its outstanding separation properties. Pressure fluctuations, constantly changing eluents, and large sample throughput do not influence the separating efficiency of this column, even after very long periods. It is the «workhorse» for development and routine laboratories.

Applications

Conductivity detection
- Great differences in concentration
- High ionic strength
- ClO_2^-, ClO_3^-, ClO_4^-

Amperometric detection
- CN^-
- S^{2-}

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	250 x 4.6 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	2.5 mL/min
Maximum pressure	15 MPa
Particle size	7 µm
Organic modifier	0–100%
pH range	1–13
Temperature range	10–70 °C
Capacity	12 µmol (Cl^-)

Eluents

Carbonate eluent (standard eluent)	Sodium carbonate	636 mg/2 L	3.0 mmol/L
Sodium hydroxide eluent	Sodium hydroxide (c = 10 mol/L)	20 mL/2 L	100 mmol/L

Care

Regeneration

Rinse with 50 mL of a 0.05 mol/L solution of Na_4EDTA at a flow rate of 0.5 mL/min. Then rinse with 0.1 mol/L sodium hydroxide at 0.5 mL/min for 1 h.

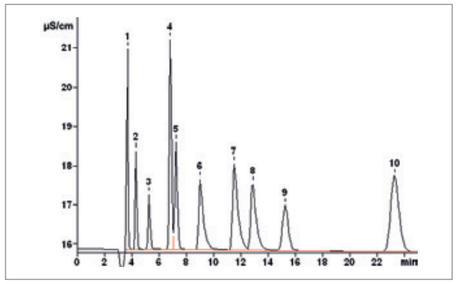
Organic contaminants:

Rinse with 70% methanol at 1.0 mL/min for 12 h. The addition of 1% acetic acid may be useful.

Storage

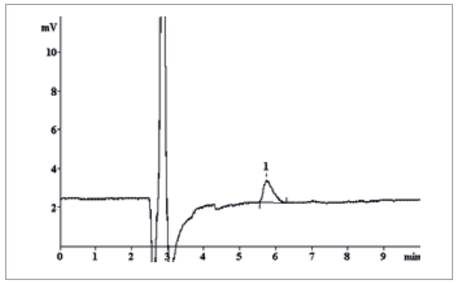
In the eluent. For a longer period (weeks), store the column in a refrigerator at minimum +4 °C.

Chromatograms



Carbonate eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	2.00	6	Chlorate	10.00
2	Chlorite	5.00	7	Nitrate	10.00
3	Bromate	5.00	8	Bromide	10.00
4	Chloride	5.00	9	Phosphate	10.00
5	Nitrite	5.00	10	Sulfate	10.00



Sodium hydroxide eluent, standard, amperometric detection

		Conc. (µg/L)
1	Cyanide	4.0

Ordering information

Metrosep A Supp 1 - 250/4.6	6.1005.300
Metrosep A Supp 1 Guard/4.6	6.1005.340

Metrosep A Supp 1 HS - 50/4.6 (6.1005.350)

The Metrosep A Supp 1 HS - 50/4.6 permits the separation of standard anions in a very short time. The Metrosep A Supp 1 HS - 50/4.6 is also the column of choice for the determination of only a few anions in an uncomplicated sample matrix. For example, the analysis of phosphate as well as chloride and sulfate in cola beverages can be carried out in less than three minutes.

Applications

- Cl^-, PO_4^{3-}, SO_4^{2-} in cola beverages
- Very rapid separation
- Standard anions in uncomplicated sample matrices

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	50 x 4.6 mm
Column body	PEEK
Standard flow	1.3 mL/min
Maximum flow	2.5 mL/min
Maximum pressure	4.0 MPa
Particle size	7 µm
Organic modifier	0–100%
pH range	1–13
Temperature range	10–70 °C
Capacity	3 µmol (Cl^-)

Eluents

Carbonate eluent (standard eluent)	Sodium carbonate	636 mg/2 L	3.0 mmol/L

Care

Regeneration

Rinse with 15 mL of a 0.05 mol/L solution of Na_4EDTA at a flow rate of 0.25 mL/min. Then rinse with 0.1 mol/L sodium hydroxide at 0.25 mL/min for 1 h.

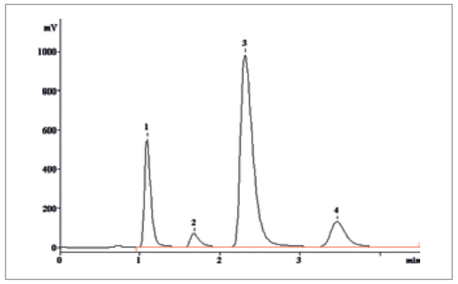
Organic contaminants:

Rinse with 70% methanol at 0.4 mL/min for 12 h. The addition of 1% acetic acid may be useful.

Storage

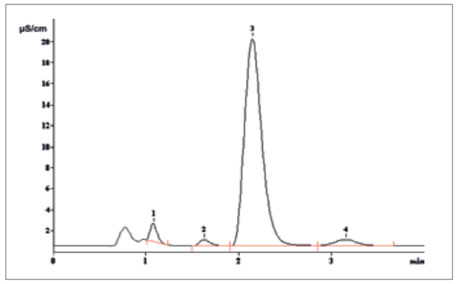
In the eluent. For a longer period (weeks), store the column in a refrigerator at minimum +4 °C.

Chromatograms



Carbonate eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Chloride	50.0	3	Phosphate	500.0
2	Nitrate	20.0	4	Sulfate	50.0



Carbonate eluent, cola beverage

		Conc. (mg/L)			Conc. (mg/L)
1	Chloride	5.0	3	Phosphate	496.3
2	Nitrate	8.2	4	Sulfate	10.4

Ordering information

Metrosep A Supp 1 HS - 50/4.6	6.1005.350
Metrosep RP 2 Guard/3.5	6.1011.030
Metrosep RP 3 Guard HC/4.0	6.1011.040

Metrosep A Supp 3 - 250/4.6 (6.1005.320)

The Metrosep A Supp 3 - 250/4.6 solves separation problems in aqueous and organic media. It can be used reliably with a wide range of eluents – even those with high proportions of organic solvents. With the Metrosep A Supp 3 - 250/4.6, highly demanding samples can be analyzed in routine operation, for example the measurement of biological samples or the determination of inorganic anions in organic matrices. With the help of a sodium hydroxide gradient, polyphosphates can be reliably separated on the Metrosep A Supp 3 - 250/4.6. In isocratic operation, the column is also suitable for the separation of sulfite, sulfate, and thiosulfate in less than 20 minutes.

Applications

- SCN^-, SO_3^{2-}, SO_4^{2-}, $S_2O_3^{2-}$
- Polyphosphates
- Organic matrices

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	250 x 4.6 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	1.5 mL/min
Maximum pressure	15 MPa
Particle size	9 µm
Organic modifier	0–100%
pH range	1–13
Temperature range	10–70 °C
Capacity	35 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	286 mg/2 L	1.7 mmol/L
(standard eluent)	Sodium carbonate	382 mg/2 L	1.8 mmol/L

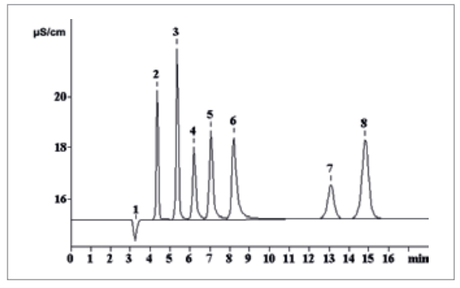
Care

Regeneration
Rinse with 50 mL of a 0.05 mol/L solution of Na_4EDTA at a flow rate of 0.5 mL/min. Then rinse with 0.1 mol/L sodium hydroxide at 0.5 mL/min for 1 h.

Organic contaminants:
Rinse with 70% methanol at 1.0 mL/min for 12 h. The addition of 1% acetic acid may be useful.

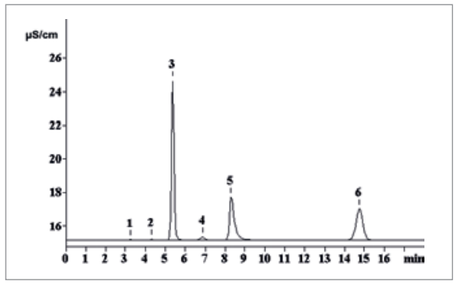
Storage
In the eluent. For a longer period (weeks), store the column in a refrigerator at minimum +4 °C.

Chromatograms



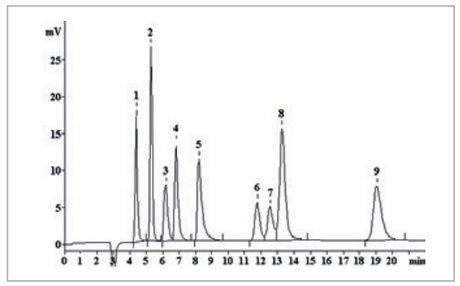
Carbonate eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Injection peak	–	5	Bromide	10.00
2	Fluoride	2.00	6	Nitrate	10.00
3	Chloride	5.00	7	Phosphate	10.00
4	Nitrite	5.00	8	Sulfate	10.00



Carbonate eluent, drinking water

		Conc. (mg/L)			Conc. (mg/L)
1	Injection peak	–	4	System peak	–
2	Fluoride	0.04	5	Nitrate	10.25
3	Chloride	5.24	6	Sulfate	6.92



Carbonate eluent, standard

			Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	1.25	6	Phosphate	5.00
2	Chloride	2.50	7	Sulfite	5.00
3	Nitrite	2.50	8	Sulfate	5.00
4	Bromide	5.00	9	Thiosulfate	5.00
5	Nitrate	5.00			

Ordering information

Metrosep A Supp 3 - 250/4.6	6.1005.320
Metrosep RP 2 Guard/3.5	6.1011.030
Metrosep RP 3 Guard HC/4.0	6.1011.040

Metrosep A Supp 5 - 50/4.0 (6.1006.550)

The Metrosep A Supp 5 - 50/4.0 separates the seven standard anions in less than six minutes. Even fluoride is still separated from the injection peak and can be integrated perfectly. Like all columns in the Metrosep-A-Supp-5 product range, the column, which is based on a polyvinyl alcohol polymer, is characterized by high plate numbers and therefore by outstanding separating efficiency. The Metrosep A Supp 5 - 50/4.0 is the column of choice when simple separation tasks must be solved in a short time – and that without having to sacrifice very low detection limits.

Applications

- Rapid separation of standard anions
- Simple sample matrices
- Method development

Technical information

Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	50 x 4.0 mm
Column body	PEEK
Standard flow	0.7 mL/min
Maximum flow	0.8 mL/min
Maximum pressure	15 MPa
Particle size	5 µm
Organic modifier	0–100%, (particularly acetone, acetonitrile, methanol)
pH range	3–12
Temperature range	20–60 °C
Capacity	17 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	168 mg/2 L	1.0 mmol/L
(standard eluent)	Sodium carbonate	678 mg/2 L	3.2 mmol/L
Perchlorate eluent	Sodium carbonate	3.178 g/2 L	15.0 mmol/L
	Acetone	200 mL/2 L	10%

Care

Regeneration

Contamination with hydrophilic ions:

a) Rinse with ultrapure water (25 min at 0.3 mL/min)
b) Rinse with 10x concentrated eluent (100 min at 0.3 mL/min)
c) Rinse with ultrapure water (25 min at 0.3 mL/min)
d) Rinse with eluent (100 min at 0.3 mL/min)

Contamination with lipophilic ions:

a) Rinse with ultrapure water (25 min at 0.3 mL/min)
b) Rinse with 5% acetonitrile (20 min at 0.3 mL/min)
c) Rinse with 100% acetonitrile (60 min at 0.3 mL/min)
d) Rinse with 50% acetonitrile (10 min at 0.3 mL/min)
e) Rinse with ultrapure water (50 min at 0.3 mL/min)
f) Rinse with eluent (100 min at 0.3 mL/min)

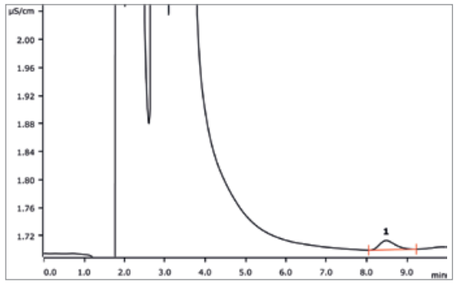
With shifted system peak (regeneration method with column oven):

a) Rinse with 1 mol/L sodium carbonate (25 min at 0.4 mL/min)
b) Maintain for 10–12 h at 45–50 °C (without rinsing)
c) Rinse with eluent (at least 40 min at 0.4 mL/min)

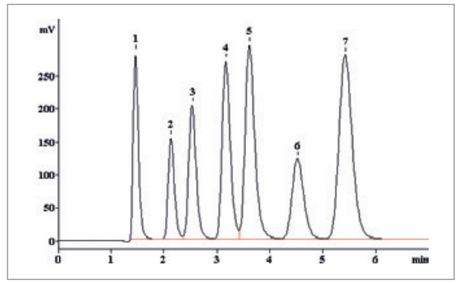
Storage

In the eluent

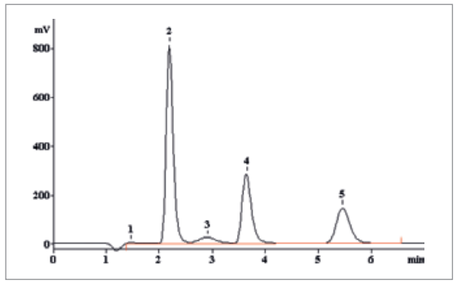
Chromatograms



Perchlorate eluent, surface water		Conc. (µg/L)
1	Perchlorate	13.4



Carbonate eluent, standard		Conc. (mg/L)			
1	Fluoride	2.00	5	Nitrate	10.00
2	Chloride	5.00	6	Phosphate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	Bromide	10.00			



Carbonate eluent, drinking water		Conc. (mg/L)			
1	Fluoride	0.04	4	Nitrate	10.36
2	Chloride	5.25	5	Sulfate	6.90
3	System peak	–			

Ordering information

Metrosep A Supp 5 - 50/4.0	6.1006.550
Metrosep A Supp 5 Guard/4.0	6.1006.500
Metrosep A Supp 5 S-Guard/4.0	6.1006.540

Metrosep A Supp 5 - 100/4.0 (6.1006.510)

The Metrosep A Supp 5 - 100/4.0 allows highly efficient, rapid separations. This property makes the Metrosep A Supp 5 - 100/4.0 the standard column for short analysis times and the determination of late eluting anions (e.g. perchlorate).

Applications

Conductivity detection
- Standard anions
- F^-, Cl^-, Br^-, I^-, ClO_2^-, ClO_3^-, ClO_4^-, BrO_3^-
- ClO_4^-
- Cr(VI) (CrO_4^{2-}), I^-
- Method development
- Universal applications
- Determination of phosphate in cola beverages
- Rapid separation

Amperometric detection
- NO_2^-, ClO_2^-
- $S_2O_3^{2-}$, SCN^-, I^-

Technical information	
Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	100 x 4.0 mm
Column body	PEEK
Standard flow	0.7 mL/min
Maximum flow	0.8 mL/min
Maximum pressure	15 MPa
Particle size	5 µm
Organic modifier	0–100%, (particularly acetone, acetonitrile, methanol)
pH range	3–12
Temperature range	20–60 °C
Capacity	34 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	168 mg/2 L	1.0 mmol/L
(standard eluent)	Sodium carbonate	678 mg/2 L	3.2 mmol/L
Cola eluent	Sodium hydrogen carbonate	504 mg/2 L	3.0 mmol/L
	Sodium carbonate	1484 mg/2 L	7.0 mmol/L

Care

Regeneration

Contamination with hydrophilic ions:
a) Rinse with ultrapure water (25 min at 0.3 mL/min)
b) Rinse with 10x concentrated eluent (100 min at 0.3 mL/min)
c) Rinse with ultrapure water (25 min at 0.3 mL/min)
d) Rinse with eluent (100 min at 0.3 mL/min)

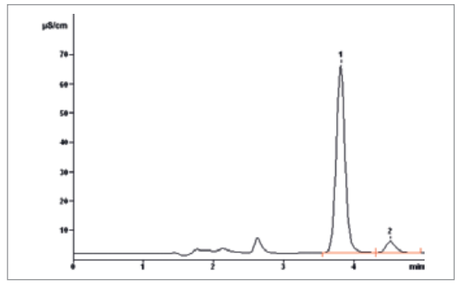
Contamination with lipophilic ions:
a) Rinse with ultrapure water (25 min at 0.3 mL/min)
b) Rinse with 5% acetonitrile (20 min at 0.3 mL/min)
c) Rinse with 100% acetonitrile (60 min at 0.3 mL/min)
d) Rinse with 50% acetonitrile (10 min at 0.3 mL/min)
e) Rinse with ultrapure water (50 min at 0.3 mL/min)
f) Rinse with eluent (100 min at 0.3 mL/min)

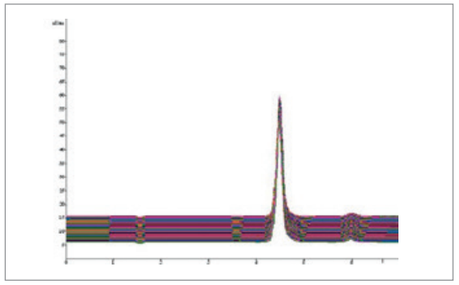
With shifted system peak (regeneration method with column oven):
a) Rinse with 1 mol/L sodium carbonate (25 min at 0.4 mL/min)
b) Maintain for 10–12 h at 45–50 °C (without rinsing)
c) Rinse with eluent (at least 40 min at 0.4 mL/min)

Storage

In the eluent

Chromatograms

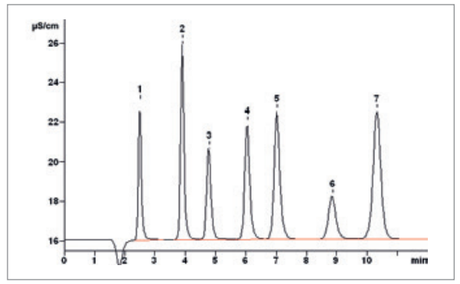




Cola eluent, cola beverage — Conc. (mg/L)

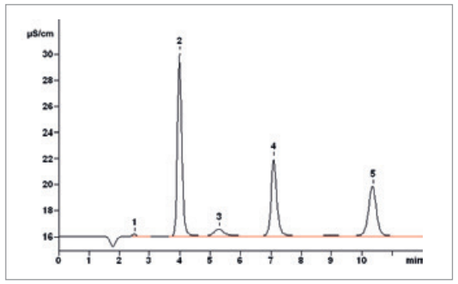
1	Phosphate	532.53	2	Sulfate	36.63

RSD retention time < 0.1% — Number of analyses n = 400
RSD concentration < 0.2%



Carbonate eluent, standard — Conc. (mg/L)

1	Fluoride	2.00	5	Nitrate	10.00
2	Chloride	5.00	6	Phosphate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	Bromide	10.00			



Carbonate eluent, drinking water — Conc. (mg/L)

1	Fluoride	0.04	4	Nitrate	10.30
2	Chloride	5.15	5	Sulfate	6.89
3	System peak	–			

Ordering information

Metrosep A Supp 5 - 100/4.0	6.1006.510
Metrosep A Supp 5 Guard/4.0	6.1006.500
Metrosep A Supp 5 S-Guard/4.0	6.1006.540

Metrosep A Supp 5 - 150/4.0 (6.1006.520)

The 150 mm version of the Metrosep A Supp 5 is characterized by its very good separation properties. High plate numbers and excellent peak symmetries simplify working in the lower µg/L range. The particle size of 5 µm makes a decisive contribution to the separating efficiency of this column. The Metrosep A Supp 5 - 150/4.0 offers the optimum combination of selectivity and capacity, with which even complex separation tasks can be solved within a short time. This characteristic makes the Metrosep A Supp 5 - 150/4.0 one of the best universally applicable standard IC columns.

Applications

- Standard anions
- F^-, Cl^-, Br^-, I^-
- ClO_2^-, ClO_3^-, ClO_4^-, BrO_3^-
- Cr(VI) (CrO_4^{2-})
- Method development
- Difficult matrices
- Difficult separation problems

Technical information

Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	150 x 4.0 mm
Column body	PEEK
Standard flow	0.7 mL/min
Maximum flow	0.8 mL/min
Maximum pressure	15 MPa
Particle size	5 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–12
Temperature range	20–60 °C
Capacity	51 µmol (Cl^-)

Eluents

Carbonate eluent	Sodium hydrogen carbonate	168 mg/2 L	1.0 mmol/L
(standard eluent)	Sodium carbonate	678 mg/2 L	3.2 mmol/L
Chromate eluent	Sodium hydrogen carbonate	672 mg/2 L	4.0 mmol/L
	Sodium carbonate	2714 mg/2 L	12.8 mmol/L

Care

Regeneration

Contamination with hydrophilic ions:

a) Rinse with ultrapure water (25 min at 0.3 mL/min)
b) Rinse with 10x concentrated eluent (100 min at 0.3 mL/min)
c) Rinse with ultrapure water (25 min at 0.3 mL/min)
d) Rinse with eluent (100 min at 0.3 mL/min)

Contamination with lipophilic ions:

a) Rinse with ultrapure water (25 min at 0.3 mL/min)
b) Rinse with 5% acetonitrile (20 min at 0.3 mL/min)
c) Rinse with 100% acetonitrile (60 min at 0.3 mL/min)
d) Rinse with 50% acetonitrile (10 min at 0.3 mL/min)
e) Rinse with ultrapure water (50 min at 0.3 mL/min)
f) Rinse with eluent (100 min at 0.3 mL/min)

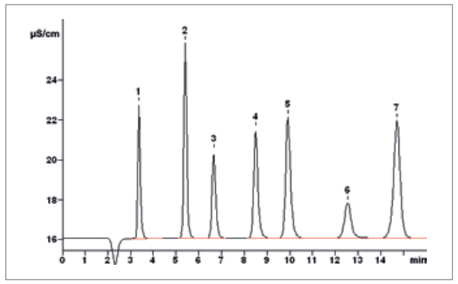
With shifted system peak (regeneration method with column oven):

a) Rinse with 1 mol/L sodium carbonate (25 min at 0.4 mL/min)
b) Maintain for 10–12 h at 45–50 °C (without rinsing)
c) Rinse with eluent (at least 40 min at 0.4 mL/min)

Storage

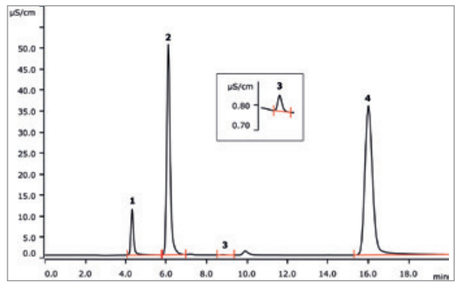
In the eluent

Chromatograms



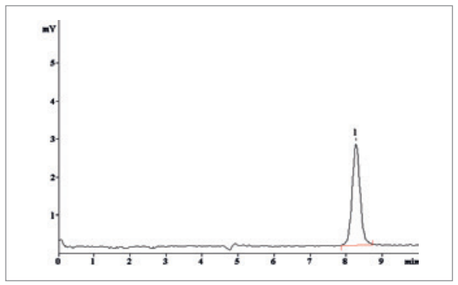
Carbonate eluent, standard — Conc. (mg/L)

1	Fluoride	2.00	5	Nitrate	10.00
2	Chloride	5.00	6	Phosphate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	Bromide	10.00			



Carbonate eluent, biomass with combustion IC — Conc. (mg/kg)

1	Fluoride	276	3	Bromide	14
2	Chloride	2326	4	Sulfate	2262



Chromate eluent, leather extract,
VIS detection (λ = 540 nm), inline dialysis — Conc. (µg/L)

1	Chromate	19.0

Ordering information

Metrosep A Supp 5 - 150/4.0	6.1006.520
Metrosep A Supp 5 Guard/4.0	6.1006.500
Metrosep A Supp 5 S-Guard/4.0	6.1006.540

Metrosep A Supp 5 - 250/4.0 (6.1006.530)

The high-performance separation column from Metrohm with an extremely high number of plates for the most demanding separation tasks. Even complex separation problems can be solved easily and reproducibly with the Metrosep A Supp 5 - 250/4.0. The high capacity of the column allows, for example, the detection of 1 µg/L bromate along with 150 mg/L chloride without sample preparation. The range of applications possible with this column far exceeds the detection of standard anions. The Metrosep A Supp 5 - 250/4.0 is the column of choice when it comes to reliable monitoring of the high purity standards in the semiconductor industry or of the boiler feed water of power plants.

Applications

- Standard anions
- F^-, Cl^-, Br^-, I^-
- ClO_2^-, ClO_3^-, ClO_4^-, BrO_3^-
- ClO_4^- at high ionic strength
- BrO_3^- at high ionic strength
- Method development
- Universal applications
- Difficult matrices
- Difficult separation problems
- Applications with gradient

Technical information

Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	0.7 mL/min
Maximum flow	0.8 mL/min
Maximum pressure	15 MPa
Particle size	5 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–12
Temperature range	20–60 °C
Capacity	85 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	168 mg/2 L	1.0 mmol/L
(standard eluent)	Sodium carbonate	678 mg/2 L	3.2 mmol/L

Care

Regeneration

Contamination with hydrophilic ions:

a) Rinse with ultrapure water (25 min at 0.3 mL/min)
b) Rinse with 10x concentrated eluent (100 min at 0.3 mL/min)
c) Rinse with ultrapure water (25 min at 0.3 mL/min)
d) Rinse with eluent (100 min at 0.3 mL/min)

Contamination with lipophilic ions:

a) Rinse with ultrapure water (25 min at 0.3 mL/min)
b) Rinse with 5% acetonitrile (20 min at 0.3 mL/min)
c) Rinse with 100% acetonitrile (60 min at 0.3 mL/min)
d) Rinse with 50% acetonitrile (10 min at 0.3 mL/min)
e) Rinse with ultrapure water (50 min at 0.3 mL/min)
f) Rinse with eluent (100 min at 0.3 mL/min)

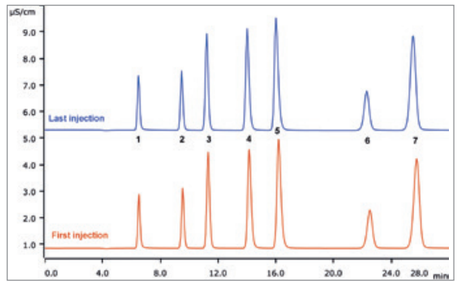
With shifted system peak (regeneration method with column oven):

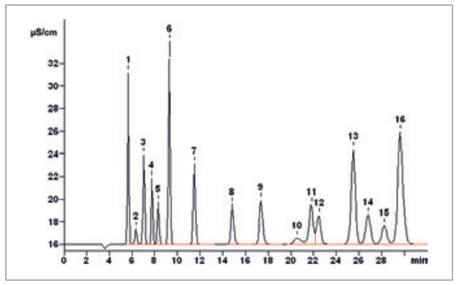
a) Rinse with 1 mol/L sodium carbonate (25 min at 0.4 mL/min)
b) Maintain for 10–12 h at 45–50 °C (without rinsing)
c) Rinse with eluent (at least 40 min at 0.4 mL/min)

Storage

In the eluent

Chromatograms



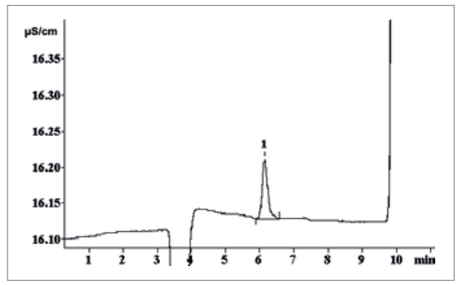


Carbonate eluent, first and last QC standard, 2150 injections

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	1.00	5	Nitrate	10.00
2	Chloride	2.00	6	Phosphate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	Bromide	10.00			

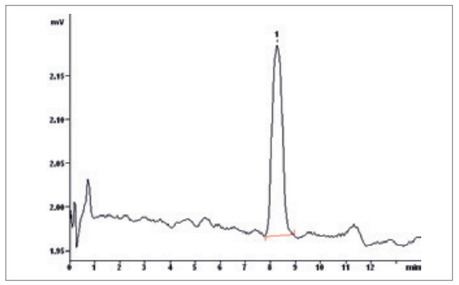
Carbonate eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	5.00	9	Nitrate	4.00
2	Acetate	1.00	10	Benzoate	1.00
3	Formate	4.00	11	Phosphate	5.00
4	Chlorite	3.00	12	Selenite	3.00
5	Bromate	2.00	13	Sulfate	10.00
6	Chloride	10.00	14	Succinate	4.00
7	Nitrite	5.00	15	Arsenate	3.00
8	Bromide	3.00	16	Oxalate	15.00



Carbonate eluent, fluoride in HCl (32%) dil. 1:500

		Conc. (µg/L)
1	Fluoride	20.0



Carbonate eluent, VIS detection (λ = 450 nm), EPA 317.0

		Conc. (µg/L)
1	Bromate	10.0

Ordering information

Metrosep A Supp 5 - 250/4.0	6.1006.530
Metrosep A Supp 5 Guard/4.0	6.1006.500
Metrosep A Supp 5 S-Guard/4.0	6.1006.540

Metrosep A Supp 7 - 150/4.0 (6.1006.620)

The Metrosep A Supp 7 - 150/4.0 is the shorter Metrosep A Supp 7 column. It allows similarly complex separation tasks to be solved the same way as with the 250 mm version, with no significant loss in separating efficiency. Chlorite and bromate can thus be easily separated from standard anions with this separation column. With the Metrosep A Supp 7 - 150/4.0, these ions are determined with certainty and precision down to the lower µg/L range. The high detection sensitivity is achieved through the use of the 5 µm polyvinyl alcohol polymer, with which extremely high plate numbers and thus outstanding separation and detection properties are achieved. In addition, the separation can be adapted to the specific requirements of the application by modifying the temperature.

Applications

- Standard anions
- Determination of standard anions and ClO_2^-, ClO_3^-, BrO_3^-
- Complex separation tasks
- Applications with gradient

Technical information

Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	150 x 4.0 mm
Column body	PEEK
Standard flow	0.7 mL/min
Maximum flow	1.0 mL/min
Maximum pressure	15 MPa
Particle size	5 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–12
Temperature range	20–60 °C
Capacity	66 µmol (Cl^-)

Eluent

Carbonate eluent (standard eluent)	Sodium carbonate	763 mg/2 L	3.6 mmol/L

Care

Regeneration

Contamination with low-valency hydrophilic ions:

a) Rinse with ultrapure water (25 min at 0.3 mL/min)
b) Rinse with 10x concentrated eluent (100 min at 0.3 mL/min)
c) Rinse with ultrapure water (25 min at 0.3 mL/min)
d) Rinse with eluent (100 min at 0.3 mL/min)

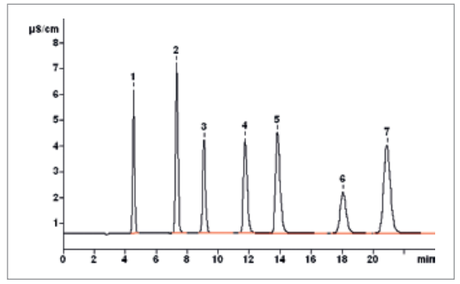
Contaminations with high-valency hydrophobic ions and organic contaminations:

a) Rinse with ultrapure water (25 min at 0.3 mL/min)
b) Rinse with 100% acetonitrile (20 min at 0.3 mL/min)
c) Rinse with ultrapure water (25 min at 0.3 mL/min)
d) Rinse with 10x concentrated eluent (100 min at 0.3 mL/min)
e) Rinse with ultrapure water (25 min at 0.3 mL/min)
f) Rinse with eluent (100 min at 0.3 mL/min)

Storage

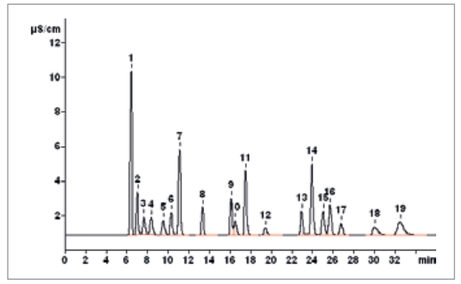
In the eluent at max. 8 °C

Chromatograms



Carbonate eluent, standard, 45 °C,

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	2.00	5	Nitrate	10.00
2	Chloride	5.00	6	Phosphate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	Bromide	10.00			



Gradient: Carbonate eluent 1–6 mmol/L, standard, 45 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	5.00	11	Nitrate	5.00
2	Glycolate	5.00	12	Dibromoacetate	5.00
3	Propionate	5.00	13	Phosphate	5.00
4	Butyrate	5.00	14	Sulfate	5.00
5	Methacrylate	5.00	15	Tartrate	5.00
6	Monochloroacetate	5.00	16	Selenate	5.00
7	Chloride	5.00	17	Arsenate	5.00
8	Nitrite	5.00	18	Iodide	5.00
9	Bromide	5.00	19	Thiosulfate	5.00
10	Dichloroacetate	5.00			

Ordering information

Metrosep A Supp 7 - 150/4.0	6.1006.620
Metrosep A Supp 5 Guard/4.0	6.1006.500
Metrosep A Supp 5 S-Guard/4.0	6.1006.540
Metrosep RP 2 Guard/3.5	6.1011.030

Metrosep A Supp 7 - 250/4.0 (6.1006.630)

Disinfection byproducts from water treatment are suspected not only of being health hazards, but even of being carcinogenic. Oxyhalides have therefore become the subject of many investigations and standards (e.g. EPA 300.1 Part A+B, EPA 317.0, EPA 326, DIN EN ISO 11206). Of primary concern is bromate, which forms from bromide during the ozonization of drinking water. The Metrosep A Supp 7 - 250/4.0 is a high-performance separation column for the parallel determination of standard anions, oxyhalides, and dichloroacetic acid. With this column, these ions are determined with certainty and precision down to the lower µg/L range. The high detection sensitivity is achieved through the use of the 5 µm polyvinyl alcohol polymer, with which extremely high plate numbers and thus outstanding separation and detection properties are achieved. In addition, the separation can be adapted to the specific requirements of the application by modifying the temperature.

Applications

- Standard anions
- EPA Method 300.1 Part A+B, simultaneous determination of standard anions and ClO_2^-, ClO_3^-, BrO_3^- and DCAA (dichloroacetic acid)
- Isocratic separation of glycolate, acetate, and formate
- Complex separation tasks
- Applications with gradient

Technical information

Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	0.7 mL/min
Maximum flow	1.0 mL/min
Maximum pressure	15 MPa
Particle size	5 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–12
Temperature range	20–60 °C
Capacity	110 µmol (Cl^-)

Eluent

Carbonate eluent (standard eluent)	Sodium carbonate	763 mg/2 L	3.6 mmol/L
Carbonate eluent (modified)	Sodium carbonate Acetone	763 mg/2 L 40 mL/2 L	3.6 mmol/L 2%

Care

Regeneration

Contamination with low-valency hydrophilic ions:

a) Rinse with ultrapure water (25 min at 0.3 mL/min)
b) Rinse with 10x concentrated eluent (100 min at 0.3 mL/min)
c) Rinse with ultrapure water (25 min at 0.3 mL/min)
d) Rinse with eluent (100 min at 0.3 mL/min)

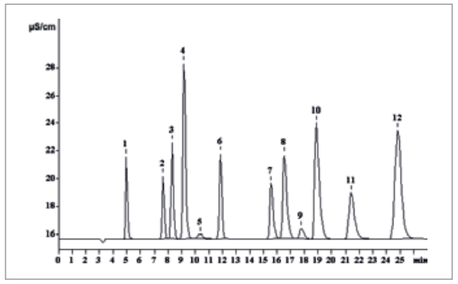
Contaminations with high-valency hydrophobic ions and organic contaminations:

a) Rinse with ultrapure water (25 min at 0.3 mL/min)
b) Rinse with 100% acetonitrile (20 min at 0.3 mL/min)
c) Rinse with ultrapure water (25 min at 0.3 mL/min)
d) Rinse with 10x concentrated eluent (100 min at 0.3 mL/min)
e) Rinse with ultrapure water (25 min at 0.3 mL/min)
f) Rinse with eluent (100 min at 0.3 mL/min)

Storage

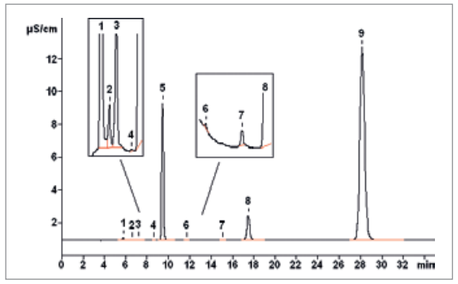
In the eluent at max. 8 °C

Chromatograms



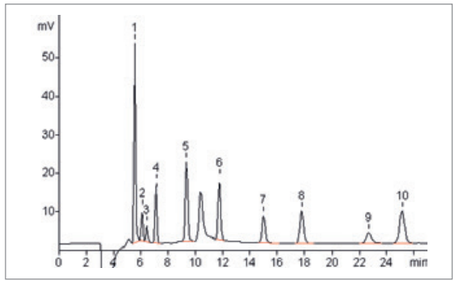
Carbonate eluent, standard, 45 °C, EPA 300.1, Parts A and B (without MCS)

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	2.00	7	Bromide	10.00
2	Chlorite	10.00	8	Chlorate	20.00
3	Bromate	20.00	9	DCAA	5.00
4	Chloride	3.00	10	Nitrate	10.00
5	System peak	–	11	Phosphate	20.00
6	Nitrite	10.00	12	Sulfate	15.00



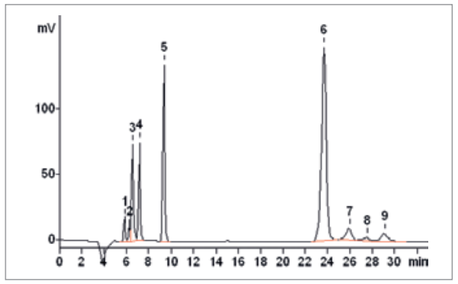
Carbonate eluent, drinking water, 45 °C, EPA 300.1, Parts A and B (with MCS)

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	0.099	6	Nitrite	0.002
2	Acetate	n.q.	7	Bromide	0.008
3	Formate	n.q.	8	Nitrate	4.378
4	Bromate	0.002	9	Sulfate	35.62
5	Chloride	6.94			



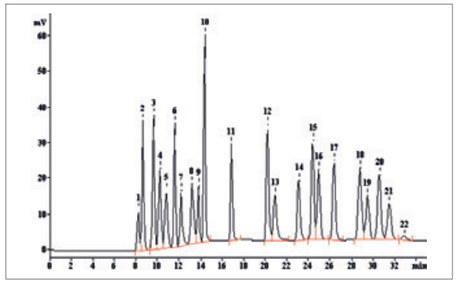
Carbonate eluent, nuclear power plant, secondary circuit (simulated), 45 ° C

		Conc. (µg/L)			Conc. (µg/L)
1	Fluoride	2.04	6	Nitrite	2.26
2	Glycolate	2.05	7	Bromide	2.06
3	Acetate	4.14	8	Nitrate	2.12
4	Formate	2.04	9	Phosphate	1.91
5	Chloride	2.09	10	Sulfate	2.18



Carbonate eluent, mod. 1, «Bayer liquor» after inline neutralization 35 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	0.35	6	Sulfate	22.59
3	Acetate	9.13	7	Malonate	3.87
4	Formate	3.71	8	Succinate	1.93
5	Chloride	5.66	9	Oxalate	2.07



Gradient: Carbonate eluent 1–5 mmol/L, standard, 45 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Galacturonate	10.00	12	Bromide	10.00
2	Fluoride	2.00	13	DCAA	10.00
3	Glycolate	10.00	14	Nitrate	5.00
4	Acetate	10.00	15	Phosphite	10.00
5	Propionate	10.00	16	Phosphate	10.00
6	Formate	5.00	17	Sulfate	5.00
7	Pyruvate	10.00	18	Tartrate	10.00
8	Methacrylate	10.00	19	Selenate	5.00
9	Monochloroacetate	5.00	20	Oxalate	5.00
10	Chloride	5.00	21	Arsenate	10.00
11	Nitrite	5.00	22	n. ident.	–

Ordering information

Metrosep A Supp 7 - 250/4.0	6.1006.630
Metrosep A Supp 5 Guard/4.0	6.1006.500
Metrosep A Supp 5 S-Guard/4.0	6.1006.540
Metrosep A Supp 16 Guard/4.0	6.1031.500
Metrosep A Supp 16 S-Guard/4.0	6.1031.510
Metrosep RP 2 Guard/3.5	6.1011.030

Metrosep A Supp 10 - 50/4.0 (6.1020.050)

The Metrosep A Supp 10 - 50/4.0 separation column is based on a high-capacity Poly(styrene-co-divinylbenzene) copolymer with a particle size of only 4.6 µm. This proven column concept optimized by Metrohm is characterized by its robust construction, high selectivity, and outstanding separating efficiency. High plate numbers and the favorable position of the system peak between fluoride and chloride complete its properties. Temperature, flow, and eluent composition can be used to modify the properties of the column to accommodate current applications directly.

The short length in conjunction with the relatively low overall capacity of this 50 mm column enable rapid separations of standard anions. They can be determined in less than nine minutes at a flow rate of 1.0 mL/min. The Metrosep A Supp 10 - 50/4.0 is well-suited to simple separation problems and uncomplicated matrices.

Applications

- Standard anions
- Separation of azide and nitrate
- Simple separation problems
- Uncomplicated matrices
- Short analysis times

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	50 x 4.0 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	2.0 mL/min
Maximum pressure	25 MPa
Particle size	4.6 µm
Organic modifier	0–100%
pH range	0–14
Temperature range	10–70 °C
Capacity	20 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	840 mg/2 L	5.0 mmol/L
(standard eluent)	Sodium carbonate	1060 mg/2 L	5.0 mmol/L
Hydroxide eluent	Sodium hydroxide (30%)	20 mL/2 L	100 mmol/L

Care

Regeneration

Rinse with 50 mL of a 0.05 mol/L solution of Na_4EDTA at a flow rate of 0.5 mL/min. Then rinse with 0.1 mol/L NaOH at 0.5 mL/min for 1 h.

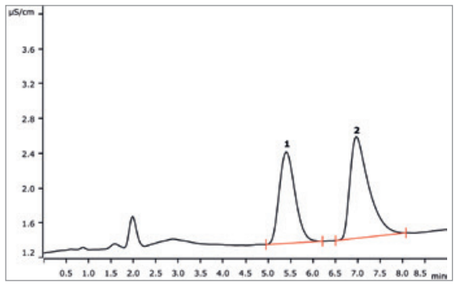
Organic contaminants:

Rinse with 70% methanol at 1.0 mL/min for 12 h. The addition of 1% acetic acid may be useful.

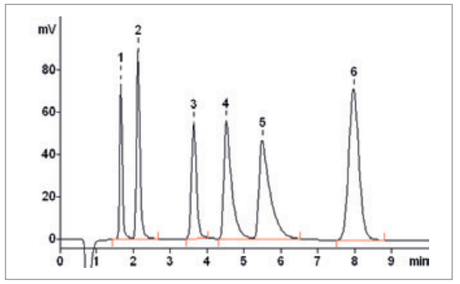
Storage

In the eluent

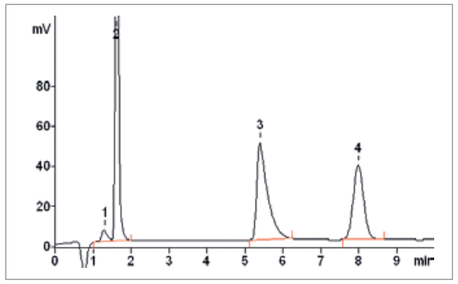
Chromatograms



Hydroxide eluent, standard					Conc. (mg/L)
1	Azide	1.0	2	Nitrate	1.0



Carbonate eluent, standard, 45 °C,					Conc. (mg/L)
1	Chloride	5.00	4	Bromide	10.00
2	Nitrite	5.00	5	Nitrate	10.00
3	Phosphate	10.00	6	Sulfate	10.00



Carbonate eluent, drinking water, 45 °C					Conc. (mg/L)
1	System peak	–	3	Nitrate	9.64
2	Chloride	10.05	4	Sulfate	5.19

Ordering information

Metrosep A Supp 10 - 50/4.0	6.1020.050
Metrosep A Supp 10 Guard/4.0	6.1020.500
Metrosep A Supp 10 S-Guard/4.0	6.1020.510

Metrosep A Supp 10 - 75/4.0 (6.1020.070)

The Metrosep A Supp 10 - 75/4.0 separation column is based on a high-capacity poly(styrene-co-divinylbenzene) copolymer with a particle size of only 4.6 µm. Under standard conditions, phosphate elutes between nitrite and bromide. Applications can be optimized by modifying temperature, composition of the eluent and flow.

The capacity of the Metrosep A Supp 10 - 75/4.0 has been optimized with respect to two aspects: matrix and speed. Baseline separation is achieved in samples with high ionic strength, e.g. for phosphate in cola beverages. Even in the presence of large quantities of nitrate and sulfate, the analysis time remains less than 7.5 minutes. High sample throughput is also of great importance in air analytics.

Applications

- Standard anions
- Air monitoring
- Aerosols with MARS/MARGA
- Separation of sulfite and sulfate
- Phosphate in addition to cyclamate in cola beverages

Technical information

Substrate	Poly(styrene-co-divinylbenzene)with quaternary ammonium groups
Column dimensions	75 x 4.0 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	2.0 mL/min
Maximum pressure	25 MPa
Particle size	4.6 µm
Organic modifier	0–100%
pH range	0–14
Temperature range	10–70 °C
Capacity	30 µmol (Cl^-)

Eluent

Carbonate eluent (standard eluent)	Sodium hydrogen carbonate	840 mg/2 L	5.0 mmol/L
	Sodium carbonate	1060 mg/2 L	5.0 mmol/L
Cola eluent	Sodium hydrogen carbonate	67 mg/2 L	0.4 mmol/L
	Sodium carbonate	1695 mg/2 L	8.0 mmol/L

Care

Regeneration

Rinse with 50 mL of a 0.05 mol/L solution of Na_4EDTA at a flow rate of 0.5 mL/min. Then rinse with 0.1 mol/L NaOH at 0.5 mL/min for 1 h.

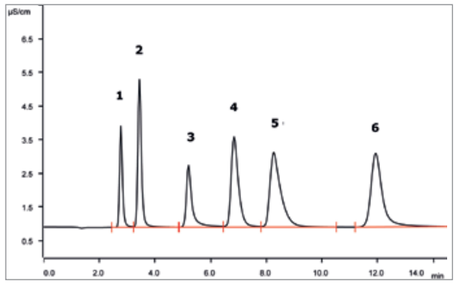
Organic contaminants:

Rinse with 70% methanol at 1.0 mL/min for 12 h. The addition of 1% acetic acid may be useful.

Storage

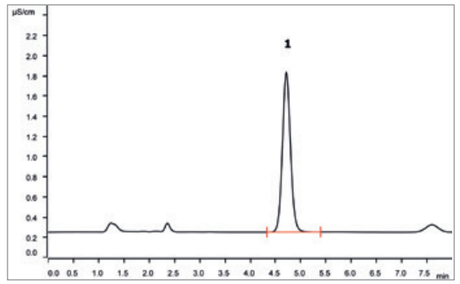
In the eluent

Chromatograms



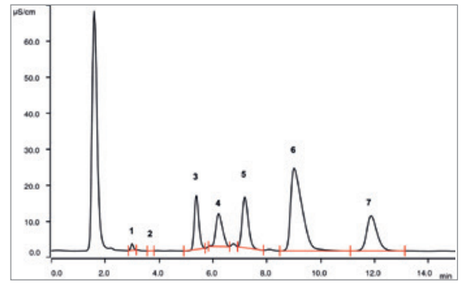
Carbonate eluent, standard, 45 °C,

					Conc. (mg/L)
1	Chloride	2.00	4	Bromide	10.00
2	Nitrite	5.00	5	Nitrate	10.00
3	Phosphate	10.00	6	Sulfate	10.00



Cola eluent, cola beverage, sample volume 250 nL, 30 °C

			Conc. (mg/L)
1	Phosphate	587.3	



Wine eluent, temperature 45 °C, flow 1.0 mL/min

					Conc. (mg/L)
1	Chloride	12.4	5	Sulfite	630.55
2	Nitrite	0.82	6	Nitrate	982.34
3	Phosphate	496.38	7	Sulfate	291.40
4	Unknown	–			

Ordering information

Metrosep A Supp 10 - 75/4.0	6.1020.070
Metrosep A Supp 10 Guard/4.0	6.1020.500
Metrosep A Supp 10 S-Guard/4.0	6.1020.510
Metrosep A Supp 10 Guard HC/4.0	6.1020.520

Metrosep A Supp 10 - 100/4.0 (6.1020.010)

The Metrosep A Supp 10 - 100/4.0 separation column is based on a high-capacity poly(styrene-co-divinylbenzene) copolymer with a particle size of only 4.6 µm. This column is characterized by high plate numbers and high selectivity. Sulfite and sulfate thus can be reliably separated in the eluent without the addition of organic modifiers. These characteristics are completed by great flexibility with respect to column temperature, flow, and the composition of the eluent.

The robust construction, excellent price-performance ratio, and very good separating efficiency, in conjunction with moderate chromatography times, make the Metrosep A Supp 10 - 100/4.0 an universally applicable anion separation column.

Applications

- Standard anions
- Separation of sulfite and sulfate
- Simple separation problems
- Uncomplicated matrices

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	100 x 4.0 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	2.0 mL/min
Maximum pressure	25 MPa
Particle size	4.6 µm
Organic modifier	0–100%
pH range	0–14
Temperature range	10–70 °C
Capacity	40 µmol (Cl^-)

Eluent

Carbonate eluent (standard eluent)	Sodium hydrogen carbonate	840 mg/2 L	5.0 mmol/L
	Sodium carbonate	1060 mg/2 L	5.0 mmol/L
Carbonate eluent (modified)	Sodium hydrogen carbonate	672 mg/2 L	4.0 mmol/L
	Sodium carbonate	1272 mg/2 L	6.0 mmol/L
	Sodium perchlorate	1.2 mg/2 L	5.0 µmol/L

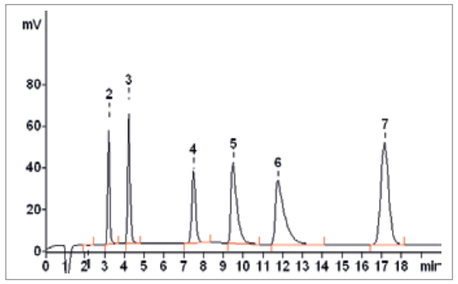
Care

Regeneration
Rinse with 50 mL of a 0.05 mol/L solution of Na_4EDTA at a flow rate of 0.5 mL/min. Then rinse with 0.1 mol/L NaOH at 0.5 mL/min for 1 h.

Organic contaminants:
Rinse with 70% methanol at 1.0 mL/min for 12 h. The addition of 1% acetic acid may be useful.

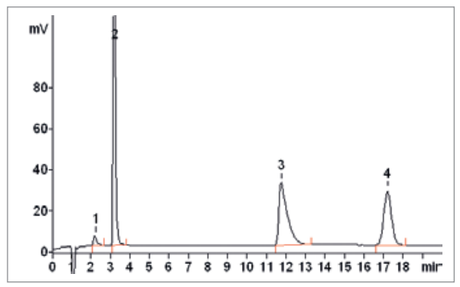
Storage
In the eluent

Chromatograms



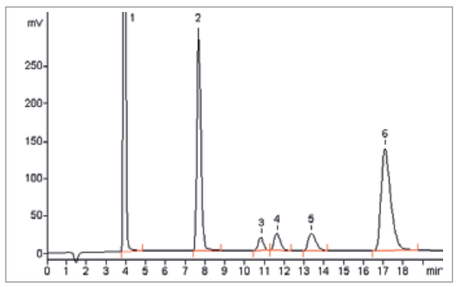
Carbonate eluent, standard, 45 °C, Conc. (mg/L)

1	System peak	–	5	Bromide	10.00
2	Chloride	5.00	6	Nitrate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	Phosphate	10.00			



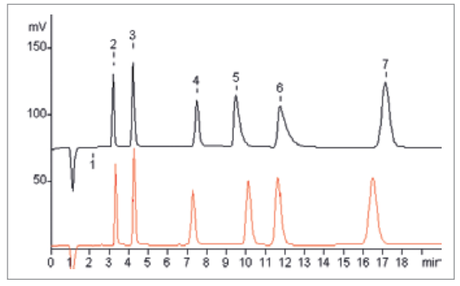
Carbonate eluent, drinking water, 45 °C Conc. (mg/L)

1	System peak	–	3	Nitrate	9.64
2	Chloride	10.05	4	Sulfate	5.19



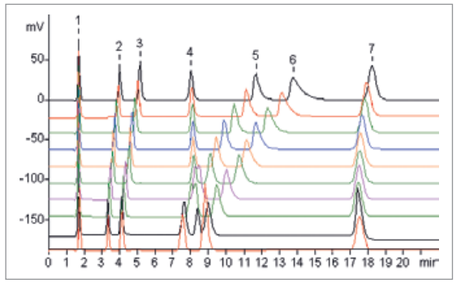
Carbonate eluent, mod., standard, room temperature Conc. (mg/L)

1	Chloride	50.00	4	Bromide	10.00
2	Phosphate	10.00	5	Nitrate	10.00
3	Sulfite	10.00	6	Sulfate	50.00



Carbonate eluent, top (black), temperature 45 °C, without 5 µmol/L ClO_4^-; bottom (red), temperature 25 °C, with 5 µmol/L ClO_4^- Conc. (mg/L)

1	System peak	–	5	Bromide	10.00
2	Chloride	2.00	6	Nitrate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	Phosphate	10.00			



Carbonate eluent, temperature 30...70 ° C in 5 °C increments (from top to bottom), with CO_2 suppressor Conc. (mg/L)

1	Fluoride	2.00	5	Bromide	10.00
2	Chloride	2.00	6	Nitrate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	Phosphate	10.00			

Ordering information

Metrosep A Supp 10 - 100/4.0	6.1020.010
Metrosep A Supp 10 Guard/4.0	6.1020.500
Metrosep A Supp 10 S-Guard/4.0	6.1020.510
Metrosep A Supp 10 Guard HC/4.0	6.1020.520

Metrosep A Supp 10 - 250/4.0 (6.1020.030)

The Metrosep A Supp 10 - 250/4.0 separation column is based on a high-capacity poly(styrene-co-divinylbenzene) copolymer with a particle size of only 4.6 µm. The longest column of the Metrosep A Supp 10 product range offers the greatest selectivity and flexibility. Utilization of the MSM-HC is particularly recommended with longer chromatogram duration. Changes in temperature, flow, and composition of the eluent also enable a wide variety of separations of anions on this separation column.

Metrosep A Supp 10 - 250/4.0 has a very high capacity. It is suitable for samples with high ionic strength, for complex separation tasks and for analyzing samples in which great differences in concentration between the individual components are present.

Applications

- Standard anions
- Complex separation problems
- Difficult matrices
- Anions in concentrated acids
- Aggressive matrices

Technical information

Substrate	Poly(styrene-co-divinylbenzene)with quaternary ammonium groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	2.0 mL/min
Maximum pressure	25 MPa
Particle size	4.6 µm
Organic modifier	0–100%
pH range	0–14
Temperature range	10–70 °C
Capacity	100 µmol (Cl^-)

Eluent

Carbonate eluent (standard eluent)	Sodium hydrogen carbonate	840 mg/2 L	5.0 mmol/L
	Sodium carbonate	1060 mg/2 L	5.0 mmol/L
Carbonate eluent (modified 1)	Sodium hydrogen carbonate	840 mg/2 L	5.0 mmol/L
	Sodium carbonate	1060 mg/2 L	5.0 mmol/L
	Acetone	50 mL	2.5%
Carbonate eluent (modified 2)	Sodium hydrogen carbonate	672 mg/2 L	4.0 mmol/L
	Sodium carbonate	1272 mg/2 L	6.0 mmol/L

Care

Regeneration

Column purification:

Rinse with 50 mL of a 0.05 mol/L solution of Na_4EDTA at a flow rate of 0.5 mL/min. Then rinse with 0.1 mol/L NaOH at 0.5 mL/min for 1 h.

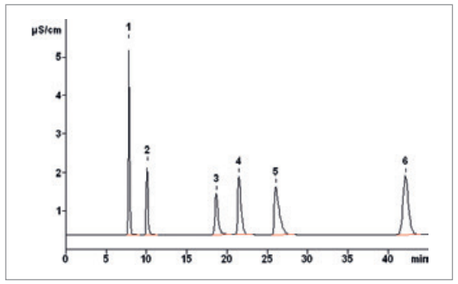
Organic contaminants:

Rinse with 70% methanol at 1.0 mL/min for 12 h. The addition of 1% acetic acid may be useful.

Storage

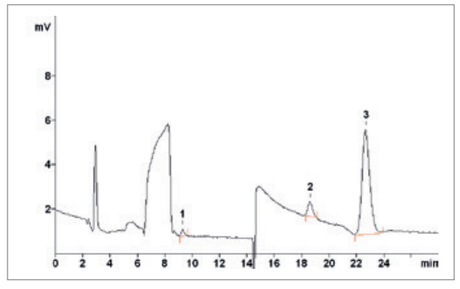
In the eluent

Chromatograms



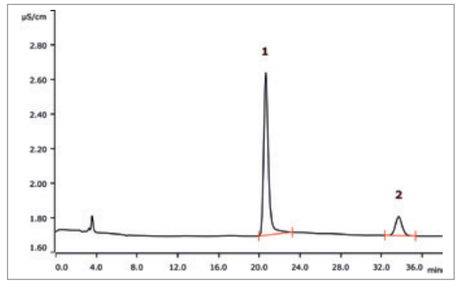
Carbonate eluent, standard, 45 °C,

					Conc. (mg/L)
1	Chloride	5.00	4	Bromide	10.00
2	Nitrite	5.00	5	Nitrate	10.00
3	Phosphate	10.00	6	Sulfate	10.00



Carbonate eluent, modified 1, artificial seawater 50°C, UV detection (λ = 218 nm)

					Conc. (mg/L)
1	Nitrite	2.1	3	Nitrate	51.2
2	Bromide	4.4			



Carbonate eluent, modified 2, ointment based on glycol, 45 °C

					Conc. (mg/kg)
1	Sulfite (from metabisulfite)	1028[a]	2	Sulfat	n.q.

[a]calculated as metabisulfite

Ordering information

Metrosep A Supp 10 - 250/4.0	6.1020.030
Metrosep A Supp 10 Guard/4.0	6.1020.500
Metrosep A Supp 10 S-Guard/4.0	6.1020.510
Metrosep A Supp 10 Guard HC/4.0	6.1020.520

Metrosep A Supp 16 - 100/4.0 (6.1031.410)

The Metrosep A Supp 16 is a high-capacity separation column based on a surface-functionalized poly(styrene-co-divinylbenzene) copolymer. The functional groups are bonded covalently. The morphology of the anion exchanger results in unique selectivity. In addition, this column type is noteworthy for its high mechanical and chemical resistance.

The column is well-suited to applications with a high ionic load but which require only relatively low resolution. Determination of bromate in water by means of the triiodide method (EPA 326, DIN EN ISO 11206) is another of the numerous applications of the Metrosep A Supp 16 - 100/4.0.

Applications

- Standard anions
- Universal applications
- Bromate (EPA 326, DIN EN ISO 11206)

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	100 x 4.0 mm
Column body	PEEK
Standard flow	0.8 mL/min
Maximum flow	1.2 mL/min
Maximum pressure	20 MPa
Particle size	4.6 µm
Organic modifier	0–10%
pH range	0–13
Temperature range	10–70 °C
Capacity	78 µmol (Cl^-)

Eluent

Carbonate/hydroxide eluent (standard eluent)	Sodium carbonate	1590 mg/2 L	7.5 mmol/L
	Sodium hydroxide (c = 0.25 mol/L)	6.0 mL/2 L	0.75 mmol/L
Sulfuric acid eluent	Sulfuric acid (c = 1 mol/L)	200 mL/2 L	100 mmol/L
	Ammonium heptamolybdate (c = 2 mmol/L)	19.3 mL/2 L	19.3 µmol/L
PCR reagent	Potassium iodide	90 g/2 L	0.27 mol/L

Care

Regeneration

Rinse the column overnight (12 h) with standard eluent at a low flow rate (0.4 mL/min).

Rinse the column with one third of the standard flow in the opposite direction for 2 h with 15 mmol/L Na_2CO_3 and then for 2 h with ultrapure water.

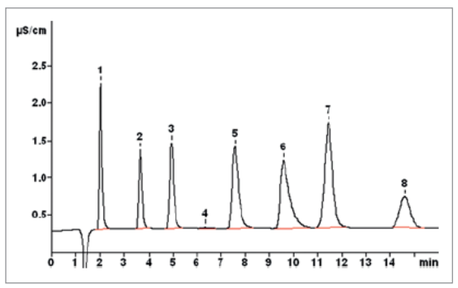
Eluent change

When installing or changing to eluents which have an organic modifier to avoid high backpressure, adjust the flow in small increments from 0.4 mL/min to match standard conditions within one hour while maintaining the direction of flow.

Storage

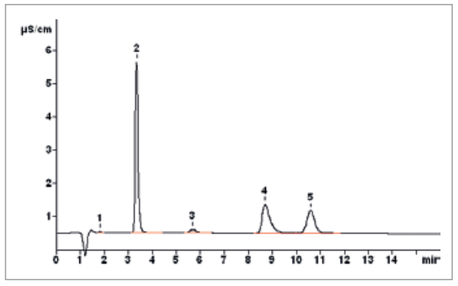
In the eluent

Chromatograms



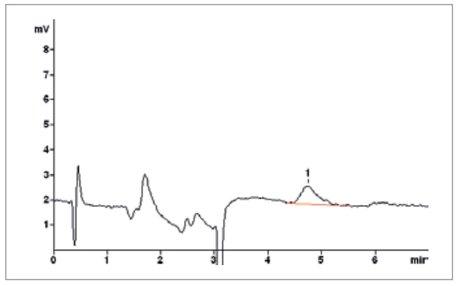
Carbonate/hydroxide eluent, standard, 45 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	2.00	5	Bromide	10.00
2	Chloride	2.00	6	Nitrate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	System peak	–	8	Phosphate	10.00



Carbonate/hydroxide eluent, drinking water, 45 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	n.q.	4	Nitrate	9.7
2	Chloride	9.2	5	Sulfate	10.2
3	System peak	–			



Sulfuric acid eluent, triiodide method with UV/VIS detection drinking water, 45 °C

		Conc. (µg/L)
1	Bromate	0.6

Ordering information

Metrosep A Supp 16 - 100/4.0	6.1031.410
Metrosep A Supp 16 Guard/4.0	6.1031.500
Metrosep A Supp 16 S-Guard/4.0	6.1031.510

Metrosep A Supp 16 - 150/4.0 (6.1031.420)

The Metrosep A Supp 16 is ideal for high-capacity separation problems and excels in its outstanding resolution. The Metrosep A Supp 16 - 150/4.0 is based on a surface-functionalized poly(styrene-co-divinylbenzene) copolymer. The functional groups are bonded covalently.

The Metrosep A Supp 16 - 150/4.0 is characterized by outstanding resolution and solves difficult separation problems. The column is well-suited to applications with a high ionic load but which do not require the highest resolution. It is one of the standard columns in anion chromatography.

Applications

- Standard anions
- Universal applications
- Azide/nitrate separation
- Matrices with high ionic strength
- Applications with gradient

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	150 x 4.0 mm
Column body	PEEK
Standard flow	0.8 mL/min
Maximum flow	1.2 mL/min
Maximum pressure	20 MPa
Particle size	4.6 µm
Organic modifier	0–10%
pH range	0–13
Temperature range	10–70 °C
Capacity	117 µmol (Cl^-)

Eluent

Carbonate/hydroxide eluent (standard eluent)	Sodium carbonate	1590 mg/2 L	7.5 mmol/L
	Sodium hydroxide (c = 0.25 mol/L)	6.0 mL/2 L	0.75 mmol/L

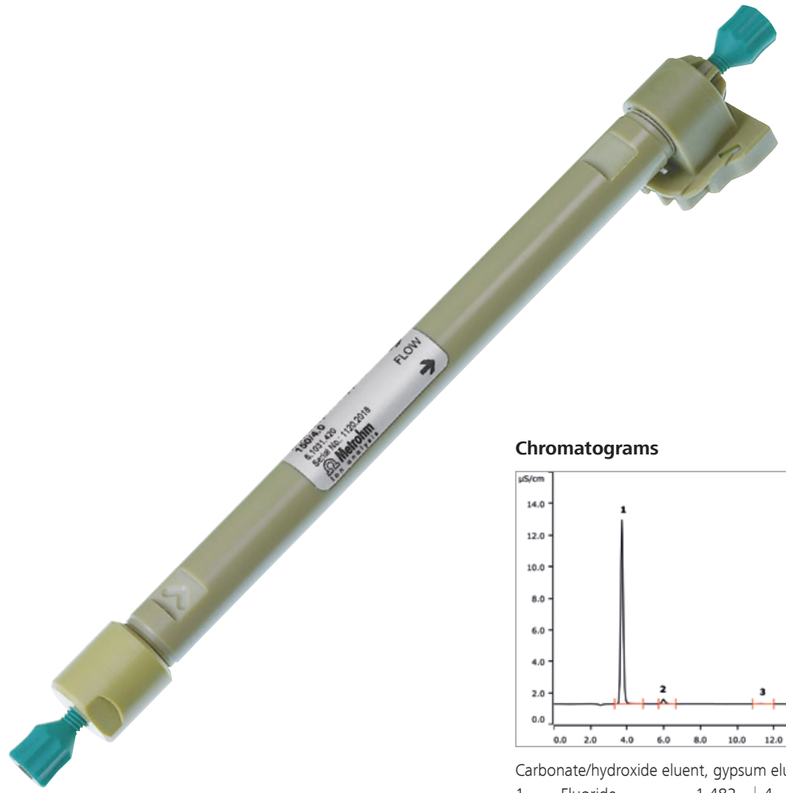
Care

Regeneration
Rinse the column overnight (12 h) with standard eluent at a low flow rate (0.4 mL/min).

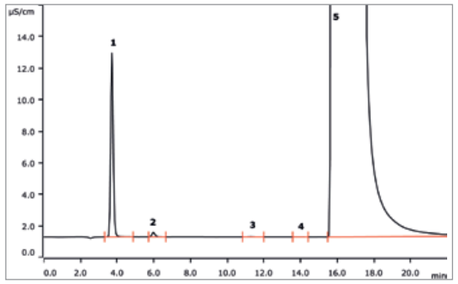
Rinse the column with one third of the standard flow in the opposite direction for 2 h with 15 mmol/L Na_2CO_3 and then for 2 h with ultrapure water.

Eluent change
When installing or changing to eluents which have an organic modifier to avoid high backpressure, adjust the flow in small increments from 0.4 mL/min to match standard conditions within one hour while maintaining the direction of flow.

Storage
In the eluent

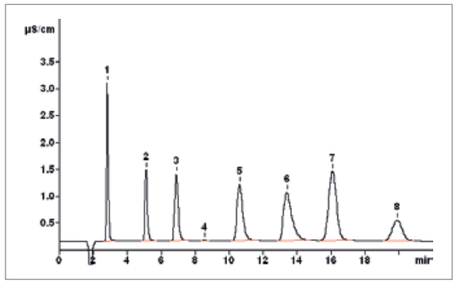


Chromatograms



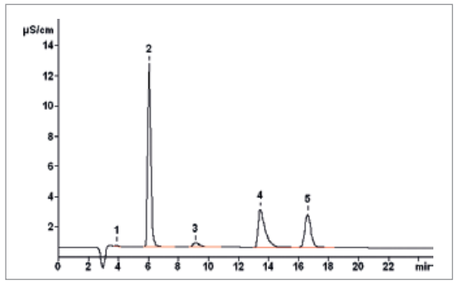
Carbonate/hydroxide eluent, gypsum eluate, 45 °C

1	Fluoride	1.482	4	Nitrate	0.004
2	Chloride	0.132	5	Sulfate	n.q.
3	Bromide	0.015			



Carbonate/hydroxide eluent, standard, 45 °C

1	Fluoride	2.00	5	Bromide	10.00
2	Chloride	2.00	6	Nitrate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	System peak	–	8	Phosphate	10.00



Carbonate/hydroxide eluent, drinking water, 45 °C

1	Fluoride	n.q.	4	Nitrate	9.7
2	Chloride	9.2	5	Sulfate	10.2
3	System peak	–			

Ordering information

Metrosep A Supp 16 - 150/4.0	6.1031.420
Metrosep A Supp 16 Guard/4.0	6.1031.500
Metrosep A Supp 16 S-Guard/4.0	6.1031.510

Metrosep A Supp 16 - 250/4.0 (6.1031.430)

The Metrosep A Supp 16 is ideal for high-capacity separation problems and distinguishes itself with its outstanding resolution, even in complex separation problems. The Metrosep A Supp 16 separation column is based on a surface-functionalized poly(styrene-co-divinylbenzene) copolymer. The functional groups are bonded covalently. This and the surface structure of the anion exchanger results in unique selectivity. The high-capacity Metrosep A Supp 16 is used for solving complex problems.

The Metrosep A Supp 16 - 250/4.0 is characterized by outstanding resolution and solves the most difficult separation problems. The column is very well-suited to monitoring electroplating baths. Traces of anions can be determined in concentrated acids. Utilization in food analysis for the determination of maltose derivatives is only one more of the numerous applications of the high-capacity Metrosep A Supp 16 - 250/4.0.

Applications

- Standard anions
- Universal applications
- Oligosaccharides and polysaccharides
- Separation of organic acids
- Cl^-, SO_4^{2-} in electroplating baths
- Quality monitoring of high-purity chemicals (e.g. conc. acids)
- Complex separation problems
- Difficult matrices

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	0.8 mL/min
Maximum flow	1.2 mL/min
Maximum pressure	20 MPa
Particle size	4.6 µm
Organic modifier	0–10%
pH range	0–13
Temperature range	10–70 °C
Capacity	195 µmol (Cl^-)

Eluent

Carbonate/hydroxide eluent (standard eluent)	Sodium carbonate	1590 mg/2 L	7.5 mmol/L
	Sodium hydroxide (c = 0.25 mol/L)	6.0 mL/2 L	0.75 mmol/L
Hydroxide eluent	Sodium hydroxide (c = 10 mol/L)	4.0 mL/2 L	20 mmol/L
Carbonate eluent	Sodium hydrogen carbonate	420 mg/2 L	2.5 mmol/L
	Sodium carbonate	1166 mg/2 L	5.5 mmol/L

Care

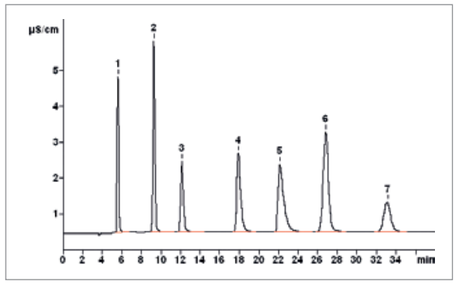
Regeneration
Rinse the column overnight (12 h) with standard eluent at a low flow rate (0.4 mL/min).

Rinse the column with one third of the standard flow in the opposite direction for 2 h with 15 mmol/L Na_2CO_3 and then for 2 h with ultrapure water.

Eluent change
When installing or changing to eluents which have an organic modifier to avoid high backpressure, adjust the flow in small increments from 0.4 mL/min to match standard conditions within one hour while maintaining the direction of flow.

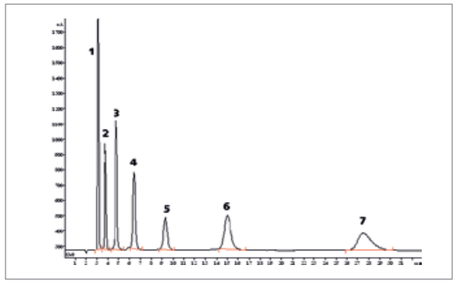
Storage
In the eluent

Chromatograms



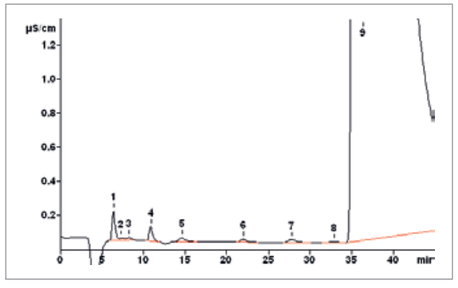
Carbonate/hydroxide eluent, standard, 45 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	2.00	5	Nitrate	10.00
2	Chloride	2.00	6	Sulfate	10.00
3	Nitrite	5.00	7	Phosphate	10.00
4	Bromide	10.00			



Hydroxide eluent, maltose derivative, 32 °C; PAD

		Conc. (mg/L)			Conc. (mg/L)
1	Glucose	5.00	5	Maltopentaose	20.00
2	Maltose	5.00	6	Maltohexaose	30.00
3	Maltotriose	10.00	7	Maltoheptaose	40.00
4	Maltotetraose	10.00			



Carbonate eluent, diluted sulfuric acid after neutralization

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	0.50	6	Bromide	0.50
2	Formate	n.q.	7	Nitrate	0.50
3	Acetate	n.q.	8	Phosphate	0.50
4	Chloride	0.50	9	Sulfate	n.q.
5	Nitrite	0.50			

Ordering information

Metrosep A Supp 16 - 250/4.0	6.1031.430
Metrosep A Supp 16 Guard/4.0	6.1031.500
Metrosep A Supp 16 S-Guard/4.0	6.1031.510

Metrosep A Supp 17 - 100/4.0 (6.01032.410)

The Metrosep A Supp 17 columns are anion separation columns for use at room temperature with a very good price-performance ratio. The Metrosep A Supp 17 - 100/4.0 enables rapid separation of the standard anions. Thanks to its great flexibility with respect to flow rates (up to 1.8 mL/min), very short analysis times can be achieved, depending on the separation problem.

Applications

- Anion determinations at room temperature
- Simple water analysis

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	100 x 4.0 mm
Column body	PEEK
Standard flow	0.6 mL/min
Maximum flow	1.8 mL/min
Maximum pressure	18 MPa
Particle size	5.0 µm
Organic modifier	0–100% methanol 0–40% acetone or acetonitrile
pH range	0–14
Temperature range	10–70 °C
Standard temperature	25 °C
Capacity	44 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	33.6 mg/2 L	0.2 mmol/L
(standard eluent)	Sodium carbonate	1060 mg/2 L	5.0 mmol/L

Care

Preparation

Rinse the column with eluent for 2–3 h.

Regeneration

Inorganic contamination

1. Rinse with ultrapure water (20 min at 0.3 mL/min)
2. Rinse with 10x concentrated standard eluent (120 min at 0.3 mL/min)
3. Rinse with ultrapure water (20 min at 0.3 mL/min)
4. Rinse with standard eluent (120 min at 0.3 mL/min)

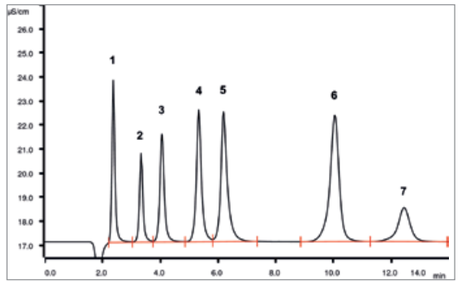
Organic contamination

1. Rinse with 70% methanol (16 h at 0.3 mL/min)
2. Rinse with standard eluent (120 min at 0.3 mL/min)

Storage

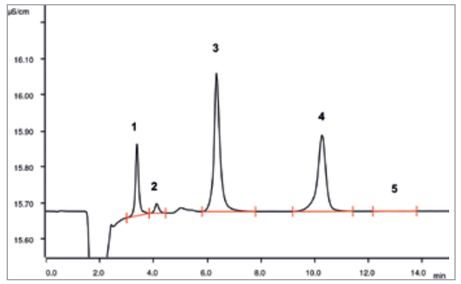
In the eluent

Chromatograms



Carbonate eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	2.00	5	Nitrate	10.00
2	Chloride	2.00	6	Sulfate	10.00
3	Nitrite	5.00	7	Phosphate	10.00
4	Bromide	10.00			



Carbonate eluent, rain water, 100 µL

		Conc. (mg/L)			Conc. (mg/L)
1	Chloride	0.04	4	Sulfate	0.18
2	Nitrite	0.01	5	Phosphate	–
3	Nitrate	0.27			

Ordering information

Metrosep A Supp 17 - 100/4.0	6.01032.410
Metrosep A Supp 17 Guard/4.0	6.01032.500
Metrosep A Supp 17 S-Guard/4.0	6.01032.510

Metrosep A Supp 17 - 150/4.0 (6.01032.420)

The separation column Metrosep A Supp 17 - 150/4.0 is the column of choice for anion determinations that require good separating efficiency and short separation times at room temperature. The maximum flow rate of 1.4 mL/min also makes it possible to optimize the determination. The Metrosep A Supp 17 columns convince with their good price-performance ratio.

Applications

- Anion determinations at room temperature
- Water analysis

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	150 x 4.0 mm
Column body	PEEK
Standard flow	0.6 mL/min
Maximum flow	1.4 mL/min
Maximum pressure	18 MPa
Particle size	5.0 µm
Organic modifier	0–100% methanol 0–40% acetone or acetonitrile
pH range	0–14
Temperature range	10–70 °C
Capacity	65 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	33.6 mg/2 L	0.2 mmol/L
(standard eluent)	Sodium carbonate	1060 mg/2 L	5.0 mmol/L

Care

Preparation

Rinse the column with eluent for 2–3 h.

Regeneration

Inorganic contamination

1. Rinse with ultrapure water (20 min at 0.3 mL/min)
2. Rinse with 10x concentrated standard eluent (120 min at 0.3 mL/min)
3. Rinse with ultrapure water (20 min at 0.3 mL/min)
4. Rinse with standard eluent (120 min at 0.3 mL/min)

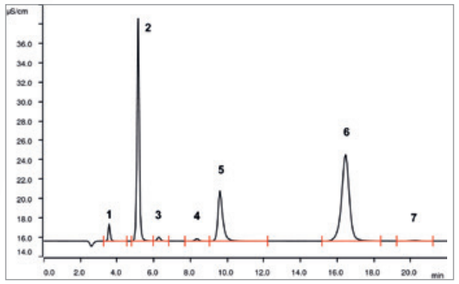
Organic contamination

1. Rinse with 70% methanol (16 h at 0.3 mL/min)
2. Rinse with standard eluent (120 min at 0.3 mL/min)

Storage

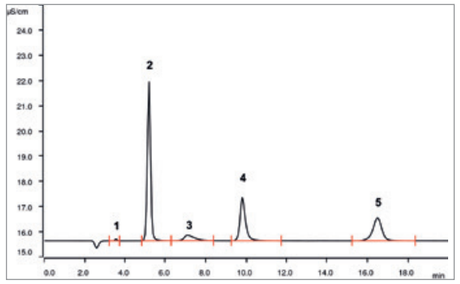
In the eluent

Chromatograms



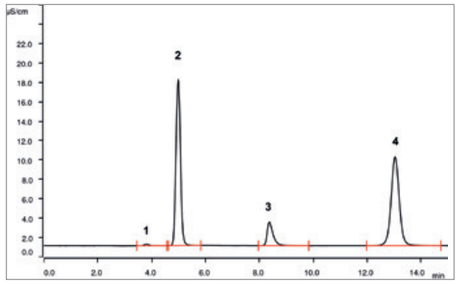
Carbonate eluent, standard

1	Fluoride	1.25	5	Nitrate	25.00
2	Chloride	25.00	6	Sulfate	50.00
3	Nitrite	1.25	7	Phosphate	1.25
4	Bromide	1.25			



Carbonate eluent, drinking water

1	Fluoride	< 1	4	Nitrate	8.77
2	Chloride	9.79	5	Sulfate	5.83
3	System peak	–			



Carbonate eluent, 0.8 mL/min flow, mineral water

1	Fluoride	< 1	3	Nitrate	3.80
2	Chloride	9.55	4	Sulfate	13.25

Ordering information

Metrosep A Supp 17 - 150/4.0	6.01032.420
Metrosep A Supp 17 Guard/4.0	6.01032.500
Metrosep A Supp 17 S-Guard/4.0	6.01032.510

Metrosep A Supp 17 - 250/4.0 (6.01032.430)

The Metrosep A Supp 17 - 250/4.0 combines high separating efficiency with a good price-performance ratio without requiring the use of a column oven. The poly(styrene-co-divinylbenzene) base material used guarantees a long service life for the column. Complex separation tasks can be solved on this column.

Applications

- Anion determinations at room temperature
- Water analysis
- Wastewater analysis
- Difficult matrices

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	0.6 mL/min
Maximum flow	1.0 mL/min
Maximum pressure	18 MPa
Particle size	5.0 µm
Organic modifier	0–100% methanol 0–40% acetone or acetonitrile
pH range	0–14
Temperature range	10–70 °C
Capacity	109 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	33.6 mg/2 L	0.2 mmol/L
(standard eluent)	Sodium carbonate	1060 mg/2 L	5.0 mmol/L
Hydroxide eluent	Sodium hydroxide (c = 10 mol/L)	10 mL/2 L	50 mmol/L

Care

Preparation

Rinse the column with eluent for 2–3 h.

Regeneration

Inorganic contamination

1. Rinse with ultrapure water (20 min at 0.3 mL/min)
2. Rinse with 10x concentrated standard eluent (120 min at 0.3 mL/min)
3. Rinse with ultrapure water (20 min at 0.3 mL/min)
4. Rinse with standard eluent (120 min at 0.3 mL/min)

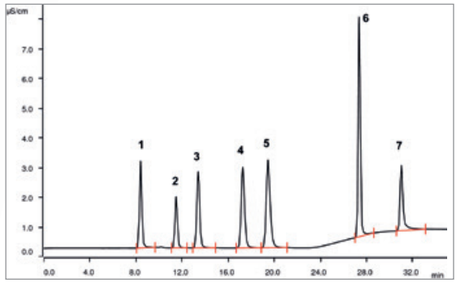
Organic contamination

1. Rinse with 70% methanol (16 h at 0.3 mL/min)
2. Rinse with standard eluent (120 min at 0.3 mL/min)

Storage

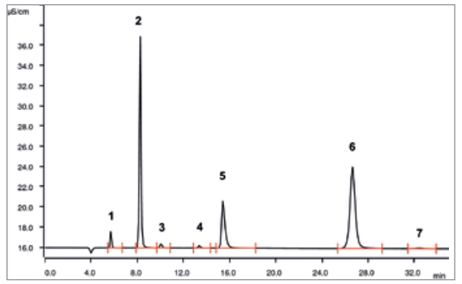
In the eluent

Chromatograms



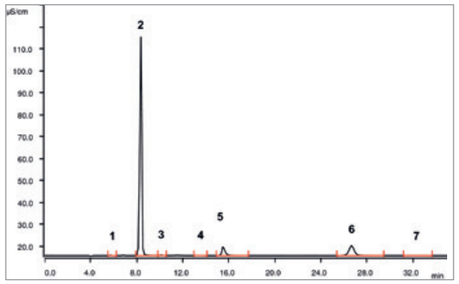
Dose-in Gradient: Hydroxide eluent — Conc. (mg/L)
10–50 mmol/L, standard

1	Fluoride	2.0	5	Nitrate	10.0
2	Chloride	2.0	6	Sulfate	10.0
3	Nitrite	10.0	7	Phosphate	10.0
4	Bromide	10.0			



Carbonate eluent, standard — Conc. (mg/L)

1	Fluoride	1.25	5	Nitrate	25.00
2	Chloride	25.00	6	Sulfate	50.00
3	Nitrite	1.25	7	Phosphate	1.25
4	Bromide	1.25			



Carbonate eluent, treated wastewater — Conc. (mg/L)

1	Fluoride	< 1	5	Nitrate	21.5
2	Chloride	102.7	6	Sulfate	29.7
3	Nitrite	< 1	7	Phosphate	< 1
4	Bromide	< 1			

Ordering information

Metrosep A Supp 17 - 250/4.0	6.01032.430
Metrosep A Supp 17 Guard/4.0	6.01032.500
Metrosep A Supp 17 S-Guard/4.0	6.01032.510
Metrosep A Supp 17 S-Guard - 50/4.0	6.01032.530

Metrosep A Supp 18 - 150/4.0 (6.01033.420)

The selectivity of the Metrosep A Supp 18 column is designed specifically for work with hydroxide eluents. The Metrosep A Supp 18 - 150/4.0 is the shorter column version of the Metrosep A Supp 18. High separating efficiencies are achieved with the small particle size of 3.5 µm. The symmetrical peaks enable simple determination of anions, including in low µg/L concentration ranges. The Metrosep A Supp 18 - 150/4.0 is particularly suitable for the separation of standard anions under isocratic conditions at room temperature.

Applications

- Anion determinations
- Water analysis

Technical information

Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	150 x 4.0 mm
Column body	PEEK
Standard flow	0.5 mL/min
Maximum flow	0.9 mL/min
Maximum pressure	22 MPa
Particle size	3.5 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–13
Temperature range	10–50 °C
Capacity	51 µmol (Cl^-)

Eluent

Hydroxide eluent	Potassium hydroxide (c = 4 mol/L)	11.5 mL/2 L	23 mmol/L

Care

Preparation

Rinse the column with eluent for 2–3 h.

Regeneration

Inorganic contamination

1. Rinse with ultrapure water in direction opposite to the flow (1 h at 0.4 mL/min)
2. Rinse with 50 mmol/L potassium hydroxide in direction opposite to the flow (2 h at 0.4 mL/min)
3. Rinse with ultrapure water (1 h at 0.4 mL/min)
4. Rinse with standard eluent (2 h at 0.4 mL/min)

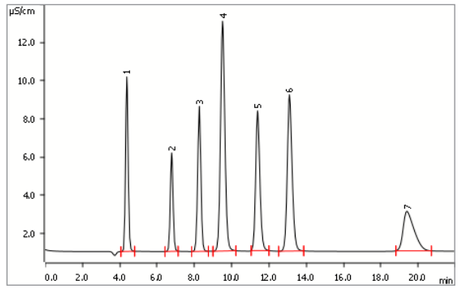
Organic contamination

1. Rinse with ultrapure water in the direction opposite to the flow (1 h at 0.4 mL/min)
2. Rinse with acetonitrile-water mixture (50:50) in the direction opposite to the flow (2 h at 0.4 mL/min)
3. Rinse with ultrapure water in the direction opposite to the flow (1 h at 0.4 mL/min)
4. Rinse with standard eluent (2 h at 0.4 mL/min)

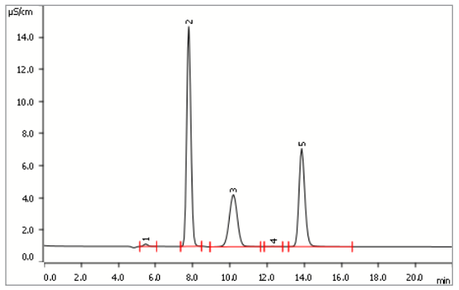
Storage

In the eluent at maximum +8°C

Chromatograms



Hydroxide eluent, standard		Conc. (mg/L)			
1	Fluoride	2.0	5	Bromide	10.0
2	Chloride	2.0	6	Nitrate	10.0
3	Nitrite	5.0	7	Phosphate	10.0
4	Sulfate	10.0			



Hydroxide eluent, tap water		Conc. (mg/L)			
1	Fluoride	0.05	4	Bromide	0.01
2	Chloride	8.98	5	Nitrate	9.98
3	Sulfate	5.36			

Ordering information

Metrosep A Supp 18 - 150/4.0	6.01033.420
Metrosep A Supp 18 Guard/4.0	6.01033.500

Metrosep A Supp 18 - 250/4.0 (6.01033.430)

The selectivity of the Metrosep A Supp 18 columns is designed specifically for work with hydroxide eluents. The Metrosep A Supp 18 - 250/4.0 is the longer column version of the Metrosep A Supp 18. High separating efficiencies are achieved with the small particle size of 3.5 µm. The symmetrical peaks enable simple determination of anions, including in low µg/L concentration ranges. In addition to the standard anions, the Metrosep A Supp 18 - 250/4.0 is particularly suitable for the separation of the oxyhalides chlorite, bromate and chlorate at room temperature.

Applications

- EPA Method 300.1 Part A+B: simultaneous determination of standard anions and ClO_2^-, ClO_3^-, BrO_3^- and DCAA (dichloroacetic acid)
- Water analysis

Technical information

Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	0.5 mL/min
Maximum flow	0.65 mL/min
Maximum pressure	22 MPa
Particle size	3.5 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–13
Temperature range	10–50 °C
Capacity	85 µmol (Cl^-)

Eluent

Hydroxide eluent	Potassium hydroxide (c = 4 mol/L)	6.5 mL	13 mmol/L
Hydroxide eluent	Potassium hydroxide (c = 4 mol/L)	26 mL/2 L	52 mmol/L

Care

Preparation

Rinse the column with eluent for 2–3 h.

Regeneration

Inorganic contamination

1. Rinse with ultrapure water in direction opposite to the flow (1 h at 0.4 mL/min)
2. Rinse with 50 mmol/L potassium hydroxide in direction opposite to the flow (2 h at 0.4 mL/min)
3. Rinse with ultrapure water (1 h at 0.4 mL/min)
4. Rinse with standard eluent (2 h at 0.4 mL/min)

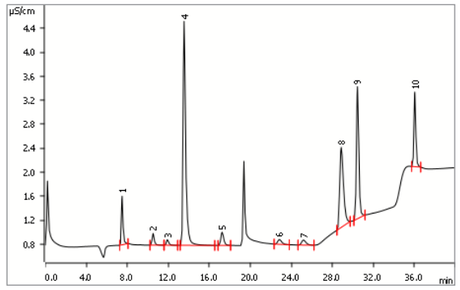
Organic contamination

1. Rinse with ultrapure water in the direction opposite to the flow (1 h at 0.4 mL/min)
2. Rinse with acetonitrile-water mixture (50:50) in the direction opposite to the flow (2 h at 0.4 mL/min)
3. Rinse with ultrapure water in the direction opposite to the flow (1 h at 0.4 mL/min)
4. Rinse with standard eluent (2 h at 0.4 mL/min)

Storage

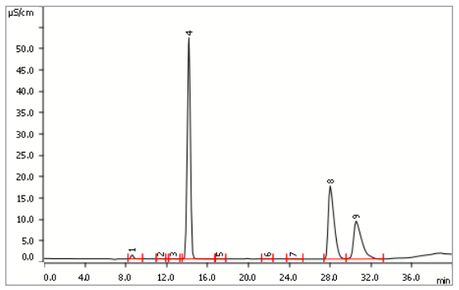
In the eluent at maximum +8°C

Chromatograms



Dose-in Gradient: Hydroxide eluent, 13-52 mmol/L, standard — Conc. (mg/L)

1	Fluoride	0.1	6	Chlorate	0.1
2	Chlorite	0.1	7	Bromide	0.1
3	Bromate	0.1	8	Nitrate	1.0
4	Chloride	1.0	9	Sulfate	1.0
5	Nitrite	0.1	10	Phosphate	0.1



Dose-in Gradient: Hydroxide eluent, 13-52 mmol/L, spiked tap water — Conc. (mg/L)

1	Fluoride	0.07	6	Chlorate	0.02
2	Chlorite	0.02	7	Bromide	0.03
3	Bromate	0.02	8	Nitrate	9.94
4	Chloride	9.07	9	Sulfate	5.38
5	Nitrite	0.02			

Ordering information

Metrosep A Supp 18 - 250/4.0	6.01033.430
Metrosep A Supp 18 Guard/4.0	6.01033.500

Metrosep A Supp 19 - 100/4.0 (6.01034.410)

Outstanding separation properties and high-capacity – these are the things which clearly distinguish the Metrosep A Supp 19 product family from the rest of the column portfolio. It features best peak symmetries and selectivities as well as high thermal, mechanical and chemical stability, which makes it extremely robust and stable in the presence of higher flow rates and pressures. The shortest anion separation column of the Metrosep A Supp 19 product family is the 100 mm version – outstandingly suitable for simple applications that require rapid and robust analytics. With elevated flow, reliable determination of the standard anions is possible in less than 7 minutes. Even at these higher flow rates, the separation between fluoride and the injection peak is guaranteed. Short elution times permit a high sample throughput, which is particularly important for contract laboratories and in routine analysis.

A further application area of the Metrosep A Supp 19 - 100/4.0 is the determination of analytes which usually have very late elution, e.g. perchlorate or citrate. Due to high flow rates and strong eluents, even analytes such as these can be determined in a very short time, thus rendering the entire analysis time-saving and efficient.

Applications

- Anion determinations at room temperature
- Fast water analysis
- Wastewater analysis
- Difficult matrices

Technical information

Substrate	Hydrophilized poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	100 x 4.0 mm
Column body	PEEK
Standard flow	0.7 mL/min
Maximum flow	1.3 mL/min
Maximum pressure	20 MPa
Particle size	4.6 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	0–14
Temperature range	10–70 °C
Capacity	94 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	42 mg/2 L	0.25 mmol/L
(standard eluent)	Sodium carbonate	1696 mg/2 L	8.0 mmol/L

Care

Preparation

Rinse the column with eluent for 1 h.

Regeneration

Inorganic contamination

1. Rinse with ultrapure water (20 min at 0.4 mL/min)
2. Rinse with 10x concentrated standard eluent (120 min at 0.4 mL/min)
3. Rinse with ultrapure water (20 min at 0.4 mL/min)
4. Rinse with standard eluent (30 min at 0.6 mL/min)

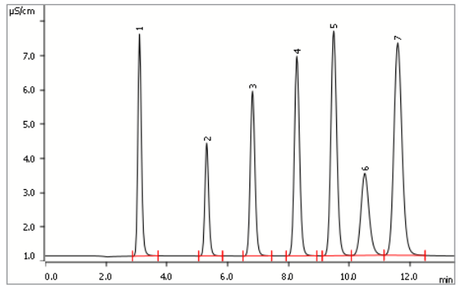
Organic contamination

1. Rinse with ultrapure water in the direction opposite to the flow (1 h at 0.4 mL/min)
2. Rinse with acetonitrile-water mixture (50:50) in the direction opposite to the flow (2 h at 0.4 mL/min)
3. Rinse with ultrapure water in the direction opposite to the flow (1 h at 0.4 mL/min)
4. Rinse with standard eluent (2 h at 0.4 mL/min)

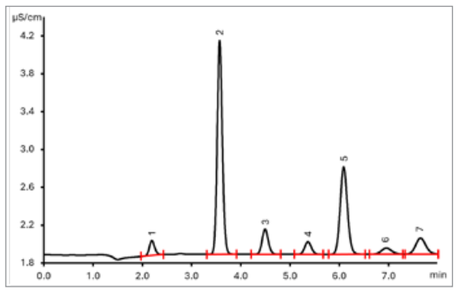
Storage

In the eluent

Chromatograms



Carbonate eluent, standard		Conc. (mg/L)			
1	Fluoride	2.0	5	Nitrate	10.0
2	Chloride	2.0	6	Phosphate	10.0
3	Nitrite	5.0	7	Sulfate	10.0
4	Bromide	10.0			



Carbonate eluent, standard		Conc. (mg/L)			
1	Fluoride	1.0	5	Nitrate	10.0
2	Chloride	10.0	6	Phosphate	1.0
3	Nitrite	1.0	7	Sulfate	1.0
4	Bromide	1.0			

Ordering information

Metrosep A Supp 19 - 100/4.0	6.01034.410
Metrosep A Supp 19 Guard/4.0	6.01034.500

Metrosep A Supp 19 - 150/4.0 (6.01034.420)

Outstanding separation properties and high-capacity – these are the things which clearly distinguish the Metrosep A Supp 19 product family from the rest of the column portfolio. It features best peak symmetries and selectivities as well as high thermal, mechanical and chemical stability, which makes it extremely robust and stable in the presence of higher flow rates and pressures. The 150 mm version is considered the standard column for anion chromatography, as it reliably solves the lion's share of applications and is very versatile in its use. Thanks to its high capacity, the Metrosep A Supp 19 - 150/4.0 separation column is particularly well suited even for complex applications with sophisticated matrices. The range of applications of the Metrosep A Supp 19 - 150/4.0 is very versatile, thanks to its outstanding separation properties and comprises the following applications, for example:

- Determination of standard anions (fluoride, chloride, nitrite, bromide, nitrate, phosphate and sulfate) in a wide variety of water samples;
- Determination of standard anions and organic acids in complex sample matrices, e.g. environmental or food samples;
- Determination of standard anions and organic acids in boiler feed water to ensure the safe operation of power plants;
- Determination of standard anions in pharmaceutical samples.

Applications

- Anion determinations at room temperature
- Water analysis
- Wastewater analysis
- Difficult matrices
- Pharmaceutical samples
- Anions in boiler feed water in power plants

Technical information

Substrate	Hydrophilized poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	150 x 4.0 mm
Column body	PEEK
Standard flow	0.7 mL/min
Maximum flow	1.2 mL/min
Maximum pressure	25 MPa
Particle size	4.6 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	0–14
Temperature range	10–70 °C
Capacity	140 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	42 mg/2 L	0.25 mmol/L
(standard eluent)	Sodium carbonate	1696 mg/2 L	8.0 mmol/L

Care

Preparation

Rinse the column with eluent for 1 h.

Regeneration

Inorganic contamination

1. Rinse with ultrapure water (20 min at 0.4 mL/min)
2. Rinse with 10x concentrated standard eluent (120 min at 0.4 mL/min)
3. Rinse with ultrapure water (20 min at 0.4 mL/min)
4. Rinse with standard eluent (30 min at 0.6 mL/min)

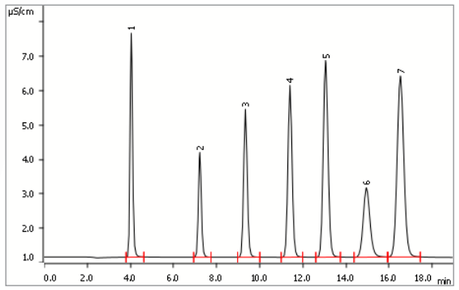
Organic contamination

1. Rinse with ultrapure water in the direction opposite to the flow (1 h at 0.4 mL/min)
2. Rinse with acetonitrile-water mixture (50:50) in the direction opposite to the flow (2 h at 0.4 mL/min)
3. Rinse with ultrapure water in the direction opposite to the flow (1 h at 0.4 mL/min)
4. Rinse with standard eluent (2 h at 0.4 mL/min)

Storage

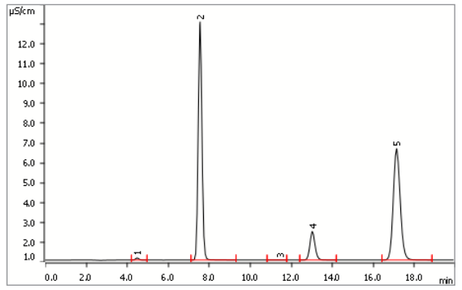
In the eluent

Chromatograms



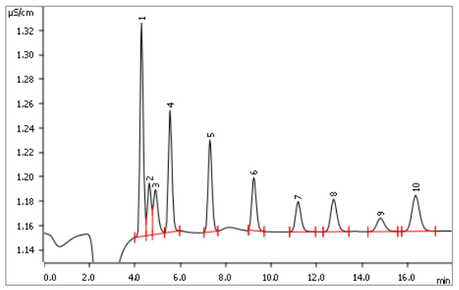
Carbonate eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	2.0	5	Nitrate	10.0
2	Chloride	2.0	6	Phosphate	10.0
3	Nitrite	5.0	7	Sulfate	10.0
4	Bromide	10.0			



Carbonate eluent, mineral water

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	0.07	4	Nitrate	3.32
2	Chloride	7.53	5	Sulfate	13.97
3	Bromide	0.11			



Carbonate eluent, boiler water, 1000 µL

		Conc. (µg/L)			Conc. (µg/L)
1	Fluoride	2	6	Nitrite	2
2	Glycolate	2	7	Bromide	2
3	Acetate	2	8	Nitrate	2
4	Formate	2	9	Phosphate	2
5	Chloride	2	10	Sulfate	2

Ordering information

Metrosep A Supp 19 - 150/4.0	6.01034.420
Metrosep A Supp 19 Guard/4.0	6.01034.500

Metrosep A Supp 19 - 250/4.0 (6.01034.430)

Outstanding separation properties and high-capacity – these are the things which clearly distinguish the Metrosep A Supp 19 product family from the rest of the column portfolio. It features best peak symmetries and selectivities as well as high thermal, mechanical and chemical stability, which makes it extremely robust and stable in the presence of higher flow rates and pressures. With the longest of the columns, i.e. the 250 mm version, the portfolio of the Metrosep A Supp 19 product family is rounded out to include a high-performance separation column. The exceptionally stable packaging ensures that the separation column will enjoy a long service life. With its unsurpassed separating efficiency, it is suitable for even the most complex application challenges. This means that the possible usages of this anion separation column greatly exceed the standard applications.

Thanks to the extremely high capacity of this separation column, combined with its outstanding plate counts, even the most demanding sample matrices are easily mastered with the Metrosep A Supp 19 - 250/4.0.

The separation column can also be readily used for gradient applications to further optimize the separation, as for example for the determination of organic acids of low molecular weight.

Applications

- Anion determinations at room temperature
- Organic acids in food and beverage
- Water analysis
- Wastewater analysis
- Difficult matrices
- Anions in boiler feed water in power plants

Technical information

Substrate	Hydrophilized poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	0.7 mL/min
Maximum flow	1.0 mL/min
Maximum pressure	25 MPa
Particle size	4.6 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	0–14
Temperature range	10–70 °C
Capacity	234 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	42 mg/2 L	0.25 mmol/L
(standard eluent)	Sodium carbonate	1696 mg/2 L	8.0 mmol/L

Care

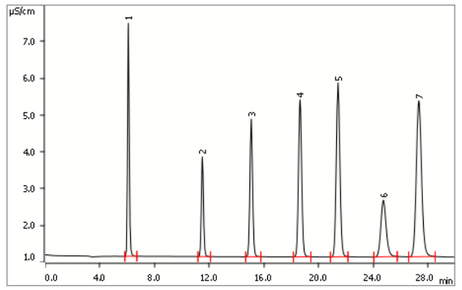
Preparation
Rinse the column with eluent for 1 h.

Regeneration
Inorganic contamination
1. Rinse with ultrapure water (20 min at 0.4 mL/min)
2. Rinse with 10x concentrated standard eluent (120 min at 0.4 mL/min)
3. Rinse with ultrapure water (20 min at 0.4 mL/min)
4. Rinse with standard eluent (30 min at 0.6 mL/min)

Organic contamination
1. Rinse with ultrapure water in the direction opposite to the flow (1 h at 0.4 mL/min)
2. Rinse with acetonitrile-water mixture (50:50) in the direction opposite to the flow (2 h at 0.4 mL/min)
3. Rinse with ultrapure water in the direction opposite to the flow (1 h at 0.4 mL/min)
4. Rinse with standard eluent (2 h at 0.4 mL/min)

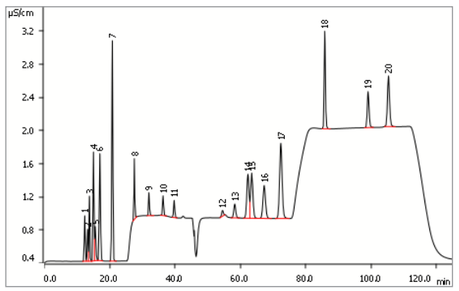
Storage
In the eluent

Chromatograms



Carbonate eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	2.0	5	Nitrate	10.0
2	Chloride	2.0	6	Phosphate	10.0
3	Nitrite	5.0	7	Sulfate	10.0
4	Bromide	10.0			



Carbonate eluent, organic acids

		Conc. (mg/L)			Conc. (mg/L)
1	Quinate	2.5	11	Nitrate	1.0
2	Galacturonate	2.5	12	Phosphate	1.0
3	Fluoride	0.5	13	Sulfate	1.0
4	Lactate	2.5	14	Malate	5.0
5	Shikimate	2.5	15	Tartrate	5.0
6	Acetate	2.5	16	Succinate	5.0
7	Formate	2.5	17	Oxalate	5.0
8	Chloride	1.0	18	Fumarate	5.0
9	Nitrite	1.0	19	Citrate	5.0
10	Bromide	1.0	20	Isocitrate	10.0

Ordering information

Metrosep A Supp 19 - 250/4.0	6.01034.430
Metrosep A Supp 19 Guard/4.0	6.01034.500

Metrosep A Supp 21 - 150/4.0 (6.01036.420)

The Metrosep A Supp 21 columns are designed for operation with hydroxide-based eluents and provide excellent separating efficiency, coupled with a very high capacity. The small particles (4.6 µm) based on hydrophilized poly(styrene-co-divinylbenzene) guarantee sharp peaks. The stationary phase exhibits high stability with respect to temperature, pressure, and pH value, and is therefore suitable for extreme working conditions.

The shorter version, Metrosep A Supp 21 - 150/4.0, is suitable for the determination of standard anions (fluoride, chloride, nitrite, bromide, nitrate, sulfate and phosphate) in all types of water samples at room temperature. With its separating efficiency, it exceeds the requirements of the US EPA method 300.1 A and of the DIN EN ISO 10304-1 standard. The high capacity of the column enables the quantification of anions in low µg/L concentrations with excellent reproducibility, even in the most challenging sample matrices.

Applications

- Anion determinations
- Water analysis
- Wastewater analysis
- Difficult matrices

Technical information

Substrate	Hydrophilized poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	150 x 4.0 mm
Column body	PEEK
Standard flow	0.8 mL/min
Maximum flow	1.4 mL/min
Maximum pressure	21 MPa
Particle size	4.6 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol, isopropanol)
pH range	0–14
Temperature range	10–70 °C
Capacity	246 µmol (Cl^-)

Eluent

Hydroxide eluent	Potassium hydroxide (c = 4 mol/L)	7.5 mg/2 L	15 mmol/L
Hydroxide eluent	Potassium hydroxide (c = 4 mol/L)	30 mL/2 L	60 mmol/L

Care

Preparation

Rinse the column with 60 mmol/L potassium hydroxide for 3–4 h.

Regeneration

Inorganic contamination

1. Rinse with 80 mmol/L potassium hydroxide in the direction opposite to the flow (120 min at 0.5 mL/min)
2. Rinse with standard eluent (30 min at 0.8 mL/min)

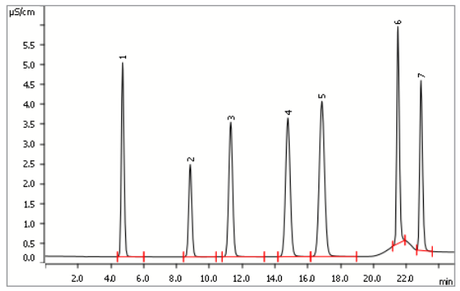
Organic contamination

1. Rinse with ultrapure water in the direction opposite to the flow (1 h at 0.5 mL/min)
2. Rinse with acetonitrile-water mixture (50:50) in the direction opposite to the flow (2 h at 0.5 mL/min)
3. Rinse with ultrapure water in the direction opposite to the flow (1 h at 0.5 mL/min)
4. Rinse with standard eluent (2 h at 0.8 mL/min)

Storage

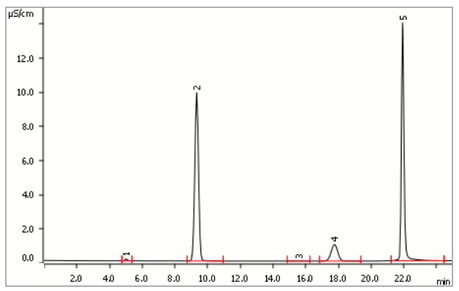
In 20 mmol/L sodium sulfate at 4 to 8 °C

Chromatograms



Dose-in Gradient: Hydroxide eluent 15-60 mmol/L, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	2.0	5	Nitrate	10.0
2	Chloride	2.0	6	Sulfate	10.0
3	Nitrite	5.0	7	Phosphate	10.0
4	Bromide	10.0			



Dose-in Gradient: Hydroxide eluent 15-60 mmol/L, mineral water

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	0.07	4	Nitrate	3.82
2	Chloride	11.15	5	Sulfate	14.52
3	Bromide	0.01			

Ordering information

Metrosep A Supp 21 - 150/4.0	6.01036.420
Metrosep A Supp 21 Guard/4.0	6.01036.500

Metrosep A Supp 21 - 250/4.0 (6.01036.430)

The Metrosep A Supp 21 columns are designed for operation with hydroxide-based eluents and provide excellent separating efficiency, coupled with a very high capacity. The small particles (4.6 µm) based on hydrophilized poly(styrene-co-divinylbenzene) guarantee sharp peaks. The stationary phase exhibits high stability with respect to temperature, pressure, and pH value, and is therefore suitable for extreme working conditions.

The longer Metrosep A Supp 21 - 250/4.0 column version was specially developed for the determination of oxyhalides (chlorite, bromate, chlorate), standard anions (fluoride, chloride, nitrite, bromide, nitrate, sulfate, and phosphate), und DCAA (dichloracetate). With its separating efficiency, it exceeds the requirements of the US EPA method 300.1 A+B and of the DIN EN ISO 10304-1&4 standard. The high column capacity enables the quantification of anions and oxyhalides in low µg/L concentrations with excellent reproducibility, even in the most challenging sample matrices. With the wide range of elution conditions available, it is also possible to determine other anionic components, e.g. low-molecular-weight organic acids.

Applications

- EPA Method 300.1 Part A+B: simultaneous determination of standard anions and ClO_2^-, ClO_3^-, BrO_3^- and DCAA (dichloroacetic acid)
- Water analysis
- Wastewater analysis
- Difficult matrices

Technical information

Substrate	Hydrophilized poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	0.8 mL/min
Maximum flow	1.5 mL/min
Maximum pressure	25 MPa
Particle size	4.6 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol, isopropanol)
pH range	0–14
Temperature range	10–70 °C
Capacity	410 µmol (Cl^-)

Eluent

Hydroxide eluent	Potassium hydroxide (c = 4 mol/L)	9 mg/2 L	18 mmol/L
Hydroxide eluent	Potassium hydroxide (c = 4 mol/L)	40 mL/2 L	80 mmol/L

Care

Preparation

Rinse the column with 60 mmol/L potassium hydroxide for 3–4 h.

Regeneration

Inorganic contamination

1. Rinse with 80 mmol/L potassium hydroxide in the direction opposite to the flow (120 min at 0.5 mL/min)
2. Rinse with standard eluent (30 min at 0.8 mL/min)

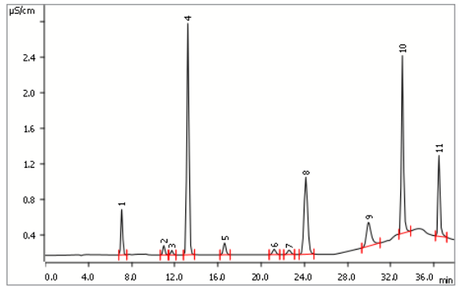
Organic contamination

1. Rinse with ultrapure water in the direction opposite to the flow (1 h at 0.5 mL/min)
2. Rinse with acetonitrile-water mixture (50:50) in the direction opposite to the flow (2 h at 0.5 mL/min)
3. Rinse with ultrapure water in the direction opposite to the flow (1 h at 0.5 mL/min)
4. Rinse with standard eluent (2 h at 0.8 mL/min)

Storage

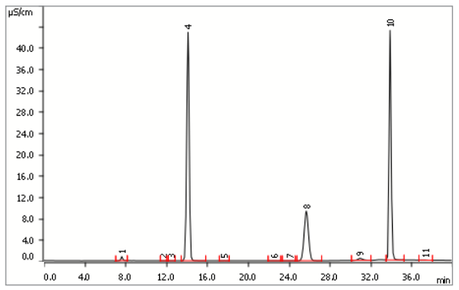
In 20 mmol/L sodium sulfate at 4 to 8 °C

Chromatograms



Dose-in Gradient: Hydroxide eluent 18-80 mmol/L, standard — Conc. (mg/L)

1	Fluoride	0.1	7	Chlorate	0.1
2	Chlorite	0.1	8	Nitrate	1.0
3	Bromate	0.1	9	Dichloroacetate	1.0
4	Chloride	1.0	10	Sulfate	1.0
5	Nitrite	0.1	11	Phosphate	1.0
6	Bromide	0.1			



Dose-in Gradient: Hydroxide eluent 18-80 mmol/L, spiked mineral water — Conc. (mg/L)

1	Fluoride	0.15	6	Bromide	0.03
2	Chlorite	0.01	7	Chlorate	0.01
3	Bromate	0.01	8	Nitrate	13.66
4	Chloride	20.13	9	Dichloroacetate	1.01
5	Nitrite	0.02	10	Sulfate	22.98

Ordering information

Metrosep A Supp 21 - 250/4.0	6.01036.430
Metrosep A Supp 21 Guard/4.0	6.01036.500

Separation columns

Microbore IC anion-separation columns for lower eluent consumption and greater sensitivity

Metrosep A Supp 4 - 250/2.0 (6.01021.230)

The microbore column Metrosep A Supp 4 - 250/2.0 is an extremely robust column with very good separation properties. The separation phase is comprised of polyvinyl alcohol particles with quaternary ammonium groups and a diameter of 9 µm. This structure guarantees great stability and a greater tolerance to very small particles that could pass through the integrated filter pad. The Metrosep A Supp 4 - 250/2.0 has a medium ion exchange capacity and is particularly suitable for all routine tasks in water analysis.

To protect the IC separation column – even though it is not particularly sensitive to contaminants – we recommend the use of the Metrosep A Supp 4 Guard/2.0.

Applications

- Standard anions
- Water analysis
- Difficult matrices
- Critical samples
- Iodide
- IC-MS coupling

Technical information	
Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	250 x 2.0 mm
Column body	PEEK
Standard flow	0.25 mL/min
Maximum flow	0.7 mL/min
Maximum pressure	15 MPa
Particle size	9 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–12
Temperature range	20–60 °C
Capacity	9 µmol (Cl^-)

Eluent

With chemical suppression

Carbonate eluent	Sodium hydrogen carbonate	286 mg/2 L	1.7 mmol/L
(standard eluent)	Sodium carbonate	382 mg/2 L	1.8 mmol/L

Care

Regeneration

Contamination with hydrophilic ions:

a) Rinse with ultrapure water (15 min at 0.1 mL/min)
b) Rinse with 10x concentrated eluent (60 min at 0.1 mL/min)
c) Rinse with ultrapure water (15 min at 0.1 mL/min)
d) Rinse with eluent (60 min at 0.1 mL/min)

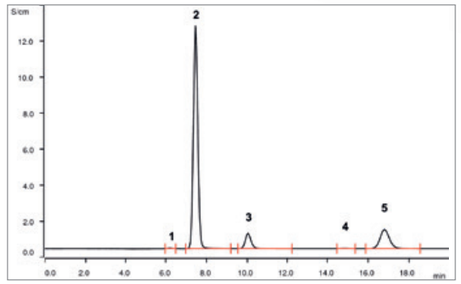
Contamination with lipophilic ions:

a) Rinse with ultrapure water (15 min at 0.1 mL/min)
b) Rinse with 5% acetonitrile (10 min at 0.1 mL/min)
c) Rinse with 100% acetonitrile (60 min at 0.1 mL/min)
d) Rinse with 50% acetonitrile (10 min at 0.1 mL/min)
e) Rinse with ultrapure water (30 min at 0.1 mL/min)
f) Rinse with eluent (60 min at 0.1 mL/min)

Storage

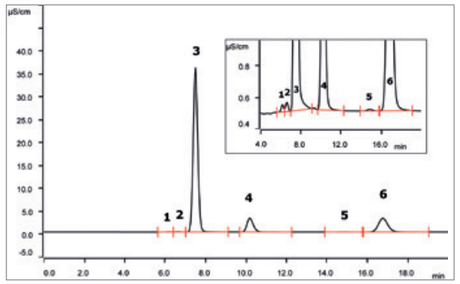
In the eluent

Chromatograms



Carbonate eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	0.008	4	Phosphate	0.080
2	Chloride	4.000	5	Sulfate	1.200
3	Nitrate	0.800			



Carbonate eluent, treated wastewater

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	0.16	4	Nitrate	26.75
2	Unknown	–	5	Phosphate	0.99
3	Chloride	113.72	6	Sulfate	30.66

Ordering information	
Metrosep A Supp 4 - 250/2.0	6.01021.230
Metrosep A Supp 4 Guard/2.0	6.01021.600

Metrosep A Supp 5 - 150/2.0 (6.1006.220)

The Metrosep A Supp 5 - 150/2.0 in the microbore version is distinguished for its excellent separation properties. The particle size of 5 µm makes a decisive contribution to the separating efficiency of this column. The Metrosep A Supp 5 - 150/2.0 offers the optimum combination of selectivity and capacity, with which even complex separation tasks can be solved within a short time. The 2 mm Metrosep A Supp 5 separation columns are packed with the same material as the corresponding 4 mm separation columns. The 150 mm version of this column type is used for universal applications at low eluent consumption.

With its low eluent flow, this column is particularly suitable for IC/MS coupling.

Applications

- Standard anions
- F^-, Cl^-, Br^-, I^-
- ClO_2^-, ClO_3^-, ClO_4^-, BrO_3^-
- Cr (VI) (CrO_4^{2-})
- Method development
- IC-MS coupling

Technical information

Substrate	Polyvinyl alcohol with quarternary ammonium groups
Column dimensions	150 x 2.0 mm
Column body	PEEK
Standard flow	0.18 mL/min
Maximum flow	0.21 mL/min
Maximum pressure	20 MPa
Particle size	5 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–12
Temperature range	20–60 °C
Capacity	13 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	168 mg/2 L	1.0 mmol/L
(standard eluent)	Sodium carbonate	678 mg/2 L	3.2 mmol/L

Care

Regeneration

Contamination with low-valence hydrophilic ions

1. Rinse with ultrapure water (25 min at 0.1 mL/min)
2. Rinse with 10x concentrated eluent (100 min at 0.1 mL/min)
3. Rinse with ultrapure water (25 min at 0.1 mL/min)
4. Rinse with eluent (100 min at 0.1 mL/min)

Contamination with high-valence hydrophobic ions or organic contaminations

1. Rinse with eluent (100 min at 0.1 mL/min)
2. Rinse with 5% acetonitrile (20 min at 0.1 mL/min)
3. Rinse with 100% acetonitrile (60 min at 0.1 mL/min)
4. Rinse with 50% acetonitrile (10 min at 0.1 mL/min)
5. Rinse with ultrapure water (25 min at 0.1 mL/min)
6. Rinse with eluent (100 min at 0.1 mL/min)

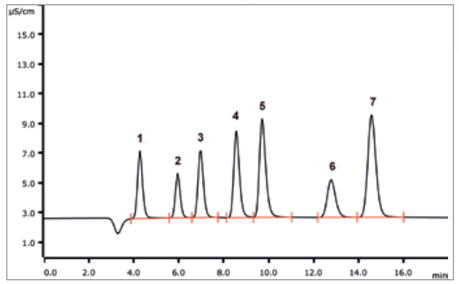
Shifted system peak

1. Regeneration method with column oven
2. Rinse with concentrated eluent of 1 mol/L Na_2CO_3 (25 min at 0.1 mL/min)
3. Maintain for 10–12 hours at 45–50 °C (without rinsing)
4. Rinse with the normal eluent (at least 40 min at 0.1 mL/min)

Storage

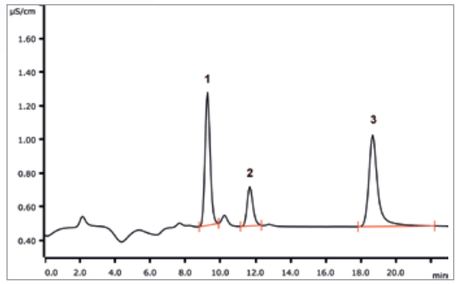
In the eluent

Chromatograms



Carbonate eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	2.00	5	Nitrate	10.00
2	Chloride	2.00	6	Phosphate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	Bromide	10.00			



Carbonate eluent, polyethylene pellets by Combustion IC (CIC)

		Conc. (mg/kg)			Conc. (mg/kg)
1	Chloride	94.2	3	Sulfate	74.7
2	Bromide	84.0			

Ordering information

Metrosep A Supp 5 - 150/2.0	6.1006.220
Metrosep A Supp 5 Guard/2.0	6.1006.600
Metrosep A Supp 5 S-Guard/2.0	6.1006.610

Metrosep A Supp 5 - 250/2.0 (6.1006.230)

The Metrosep A Supp 5 - 250/2.0 is the microbore high-performance separation column with which even complex separation problems can be solved easily and reproducibly. The range of applications possible with this column far exceeds the detection of standard anions. The Metrosep A Supp 5 - 250/2.0 is used wherever maximum separating efficiency must be combined with both the lowest of detection limits and low eluent consumption.

With its low eluent flow, this column is particularly suitable for IC/MS coupling.

Applications

- Standard anions
- F^-, Cl^-, Br^-, I^-
- ClO_2^-, ClO_3^-, ClO_4^-, BrO_3^-
- ClO_4^- at high ionic strength
- BrO_3^- at high ionic strength
- Method development
- Universal applications
- Difficult matrices
- Complex separation problems
- Applications with gradient
- IC-MS coupling

Technical information

Substrate	Polyvinyl alcohol with quarternary ammonium groups
Column dimensions	250 x 2.0 mm
Column body	PEEK
Standard flow	0.18 mL/min
Maximum flow	0.21 mL/min
Maximum pressure	20 MPa
Particle size	5 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–12
Temperature range	20–60 °C
Capacity	21 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	168 mg/2 L	1.0 mmol/L
(standard eluent)	Sodium carbonate	678 mg/2 L	3.2 mmol/L

Care

Regeneration

Contamination with low-valence hydrophilic ions

1. Rinse with ultrapure water (25 min at 0.1 mL/min)
2. Rinse with 10x concentrated eluent (100 min at 0.1 mL/min)
3. Rinse with ultrapure water (25 min at 0.1 mL/min)
4. Rinse with eluent (100 min at 0.1 mL/min)

Contamination with high-valence hydrophobic ions or organic contaminations

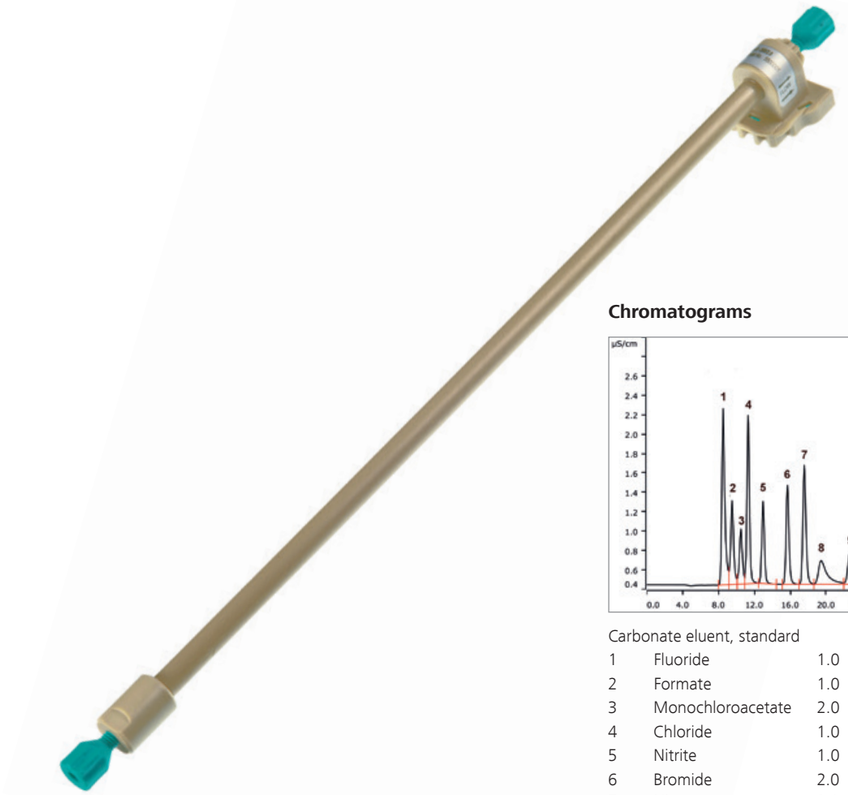
1. Rinse with eluent (100 min at 0.1 mL/min)
2. Rinse with 5% acetonitrile (20 min at 0.1 mL/min)
3. Rinse with 100% acetonitrile (60 min at 0.1 mL/min)
4. Rinse with 50% acetonitrile (10 min at 0.1 mL/min)
5. Rinse with ultrapure water (25 min at 0.1 mL/min)
6. Rinse with eluent (100 min at 0.1 mL/min)

Shifted system peak

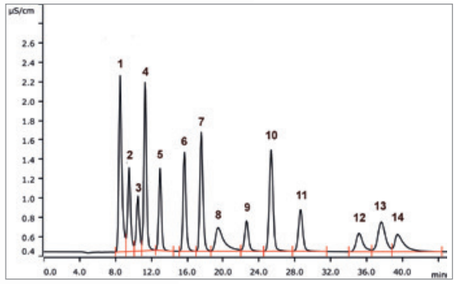
1. Regeneration method with column oven
2. Rinse with concentrated eluent of 1 mol/L Na_2CO_3 (25 min at 0.1 mL/min)
3. Maintain for 10–12 hours at 45–50 °C (without rinsing)
4. Rinse with the normal eluent (at least 40 min at 0.1 mL/min)

Storage

In the eluent

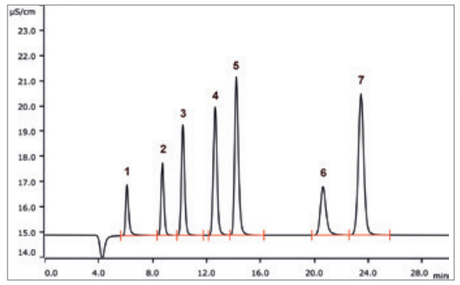


Chromatograms



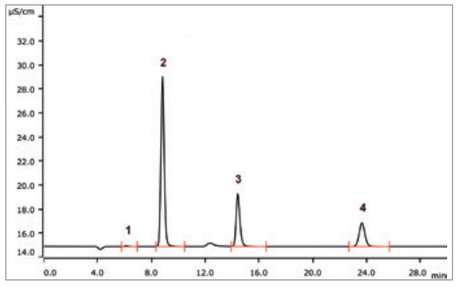
Carbonate eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	1.0	8	Benzoate	4.0
2	Formate	1.0	9	Phosphate	2.0
3	Monochloroacetate	2.0	10	Sulfate	2.0
4	Chloride	1.0	11	Oxalate	1.0
5	Nitrite	1.0	12	Tungstate	2.0
6	Bromide	2.0	13	Molybdate	2.0
7	Nitrate	2.0	14	Iodide	2.0



Carbonate eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	2.00	5	Nitrate	10.00
2	Chloride	2.00	6	Phosphate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	Bromide	10.00			



Carbonate eluent, drinking water

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	0.09	3	Nitrate	7.09
2	Chloride	9.58	4	Sulfate	3.86

Ordering information

Metrosep A Supp 5 - 250/2.0	6.1006.230
Metrosep A Supp 5 Guard/2.0	6.1006.600
Metrosep A Supp 5 S-Guard/2.0	6.1006.610

Metrosep A Supp 7 - 150/2.0 (6.1006.640)

The Metrosep A Supp 7 - 150/2.0 is the shorter of the two Metrosep A Supp 7 columns in the microbore version. It allows similarly complex separation tasks to be solved the same way as with the corresponding 250 mm version, with no significant loss in separating efficiency.

With the Metrosep A Supp 7 - 150/2.0, the ions are determined with certainty and precision down to the lower µg/L range. High detection sensitivity is achieved by using the 5 µm polyvinyl alcohol polymer, which allows extremely high plate numbers and therefore outstanding separation and detection properties. In addition, the separation can be adapted to the specific requirements of the application by modifying the temperature.

This microbore column is particularly suitable for use with an MS detector.

Applications

- Standard anions
- Fast analysis (high flow rate)
- Applications with gradient
- IC-MS

Technical information

Substrate	Polyvinyl alcohol with quarternary ammonium groups
Column dimensions	150 x 2.0 mm
Column body	PEEK
Standard flow	0.2 mL/min
Maximum flow	0.6 mL/min
Maximum pressure	20 MPa
Particle size	5 µm
Organic modifier	0–100% (particularly acetone, acetonitrile and methanol)
pH range	3–12
Temperature range	20–60 °C
Capacity	17 µmol (Cl^-)

Eluent

Carbonate eluent (standard eluent)	Sodium carbonate	763 mg/2 L	3.6 mmol/L
Carbonate eluent (modified)	Sodium carbonate	878 mg/2 L	4.0 mmol/L

Care

Regeneration procedure for contamination with low-valency hydrophilic ions:

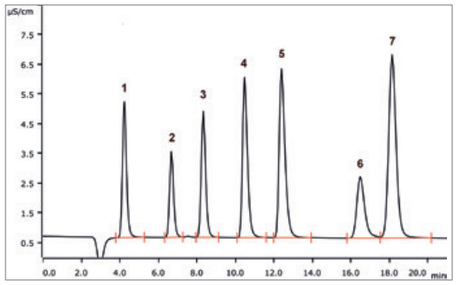
1. Rinse with ultrapure water (25 min at 0.1 mL/min)
2. Rinse with 10x concentrated eluent (100 min at 0.1 mL/min)
3. Rinse with ultrapure water (25 min at 0.1 mL/min)
4. Rinse with eluent (100 min at 0.1 mL/min)

Regeneration procedure for contamination with high-valency hydrophobic ions and organic contaminations:

1. Rinse with ultrapure water (25 min at 0.1 mL/min)
2. Rinse with 100% acetonitrile (20 min at 0.1 mL/min)
3. Rinse with ultrapure water (25 min at 0.1 mL/min)
4. Rinse with 10x concentrated eluent (100 min at 0.1 mL/min)
5. Rinse with ultrapure water (25 min at 0.1 mL/min)
6. Rinse with eluent (100 min at 0.1 mL/min)

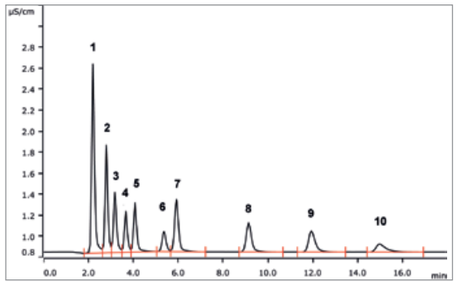
Storage
In the eluent at maximum +8 °C.

Chromatograms



Carbonate eluent, standard, 45 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	2.00	5	Nitrate	10.00
2	Chloride	2.00	6	Phosphate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	Bromide	10.00			



Carbonate eluent (mod.), standard, 55 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	1.00	6	Phosphate	1.00
2	Chloride	1.00	7	Sulfate	1.00
3	Nitrite	1.00	8	Thiosulfate	1.00
4	Bromide	1.00	9	Thiocyanate	1.00
5	Nitrate	1.00	10	Perchlorate	1.00

Ordering information

Metrosep A Supp 7 - 150/2.0	6.1006.640
Metrosep A Supp 5 Guard/2.0	6.1006.600
Metrosep A Supp 5 S-Guard/2.0	6.1006.610
Metrosep A Supp 16 Guard/2.0	6.1031.600
Metrosep A Supp 16 S-Guard/2.0	6.1031.610

Metrosep A Supp 7 - 250/2.0 (6.1006.650)

Disinfection byproducts from water treatment are suspected not only of being health hazards but also of being carcinogenic. Oxyhalides have therefore become the subject of many investigations and standards (e.g., EPA 300.1 Part A+B, EPA 317.0, EPA 326.0). Of primary concern is bromate, which forms from bromide during the ozonization of drinking water.

The longest microbore version of the Metrosep A Supp 7 columns is a high-performance separation column for the parallel determination of standard anions, oxyhalides and dichloroacetic acid. With this column, these ions are determined with certainty and precision down to the lower µg/L range. High detection sensitivity is achieved by using the 5 µm polyvinyl alcohol polymer, which allows extremely high plate numbers and therefore outstanding separation and detection properties. In addition, the separation can be adapted to the specific requirements of the application by modifying the temperature.

This microbore column is particularly suitable for use with an MS detector.

Applications

- Standard anions
- EPA 300.1 Part A+B, simultaneous determination of standard anions and ClO_2^-, ClO_3^-, BrO_3^- and DCAA (dichloroacetic acid)
- Isocratic separation of glycolate, acetate and formate
- Complex separation tasks
- Applications with gradient
- IC-MS

Technical information

Substrate	Polyvinyl alcohol with quarternary ammonium groups
Column dimensions	250 x 2.0 mm
Column body	PEEK
Standard flow	0.2 mL/min
Maximum flow	0.4 mL/min
Maximum pressure	20 MPa
Particle size	5 µm
Organic modifier	0–100% (particularly acetone, acetonitrile and methanol)
pH range	3–12
Temperature range	20–60 °C
Capacity	28 µmol (Cl^-)

Eluent

Carbonate eluent (standard eluent)	Sodium carbonate	763 mg/2 L	3.6 mmol/L

Care

Regeneration procedure for contamination with low-valency hydrophilic ions:

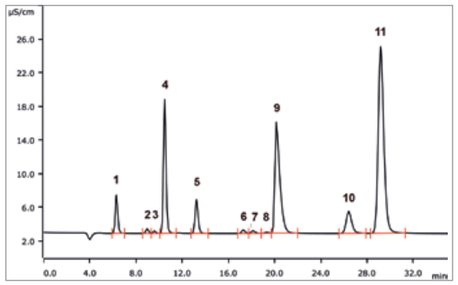
1. Rinse with ultrapure water (25 min at 0.1 mL/min)
2. Rinse with 10x concentrated eluent (100 min at 0.1 mL/min)
3. Rinse with ultrapure water (25 min at 0.1 mL/min)
4. Rinse with eluent (100 min at 0.1 mL/min)

Regeneration procedure for contamination with high-valency hydrophobic ions and organic contaminations:

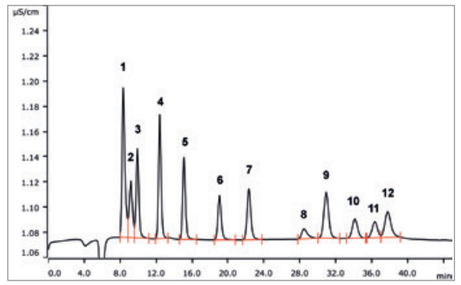
1. Rinse with ultrapure water (25 min at 0.1 mL/min)
2. Rinse with 100% acetonitrile (20 min at 0.1 mL/min)
3. Rinse with ultrapure water (25 min at 0.1 mL/min)
4. Rinse with 10x concentrated eluent (100 min at 0.1 mL/min)
5. Rinse with ultrapure water (25 min at 0.1 mL/min)
6. Rinse with eluent (100 min at 0.1 mL/min)

Storage
In the eluent at maximum +8 °C.

Chromatogram



Carbonate eluent, standard, 45 °C		Conc. (mg/L)			
1	Fluoride	2.0	7	Chlorate	1.0
2	Chlorite	1.0	8	Dichloroacetate	1.0
3	Bromate	1.0	9	Nitrate	30.0
4	Chloride	10.0	10	Phosphate	15.0
5	Nitrite	5.0	11	Sulfate	40.0
6	Bromide	1.0			



Carbonate eluent, standard, 45 °C		Conc. (mg/L)			
1	Fluoride	0.1	7	Nitrate	0.1
2	Acetate	0.1	8	Phosphate	0.1
3	Fromate	0.1	9	Sulfate	0.1
4	Chloride	0.1	10	Malonate	0.1
5	Nitrite	0.1	11	Succinate	0.1
6	Bromide	0.1	12	Oxalate	0.1

Ordering information

Metrosep A Supp 7 - 250/2.0	6.1006.650
Metrosep A Supp 5 Guard/2.0	6.1006.600
Metrosep A Supp 5 S-Guard/2.0	6.1006.610
Metrosep A Supp 16 Guard/2.0	6.1031.600
Metrosep A Supp 16 S-Guard/2.0	6.1031.610

Metrosep A Supp 10 - 50/2.0 (6.1020.250)

The Metrosep A Supp 10 - 50/2.0 separation column is based on a high-capacity poly(styrene-co-divinylbenzene) copolymer with a particle size of only 4.6 µm. Temperature, flow and eluent composition can be used to modify the properties of the column to accommodate the current application directly. The 2 mm Metrosep A Supp 10 separation columns are packed with the same material as the corresponding 4 mm separation columns. The short length and associated relatively low overall capacity of this 50 mm column enable very rapid separations of standard anions.

The Metrosep A Supp 10 - 50/2.0 is well-suited to simple separation problems and uncomplicated matrices. Thanks to its low flow, this microbore separation column is ideally suitable for IC-MS applications.

Applications

- Standard anions
- Simple separation problems
- Uncomplicated matrices
- Short analysis times
- IC-MS coupling

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	50 x 2.0 mm
Column body	PEEK
Standard flow	0.25 mL/min
Maximum flow	1.3 mL/min
Maximum pressure	25 MPa
Particle size	4.6 µm
Organic modifier	0–100%
pH range	0–14
Temperature range	10–70 °C
Capacity	5 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	840 mg/2 L	5.0 mmol/L
(standard eluent)	Sodium carbonate	1060 mg/2 L	5.0 mmol/L

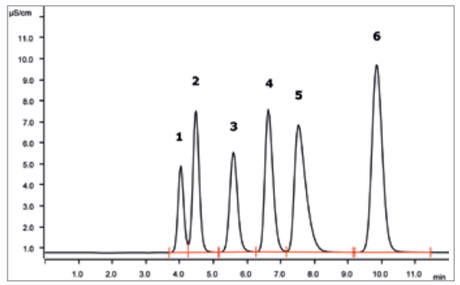
Care

Regeneration
Rinse with 50 mL of a 0.05 mol/L solution of Na_4EDTA at a flow rate of 0.12 mL/min. Then rinse with 0.1 mol/L NaOH at 0.12 mL/min for 1 h.

Organic contaminants:
Rinse with 70% methanol at 0.12 mL/min for 12 h. The addition of 1% acetic acid may be useful.

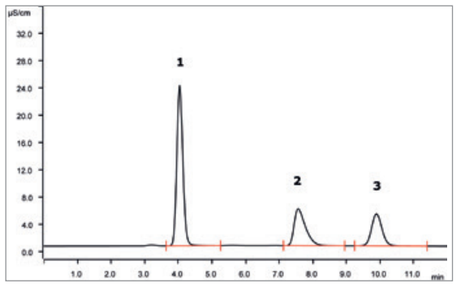
Storage
In the eluent

Chromatograms



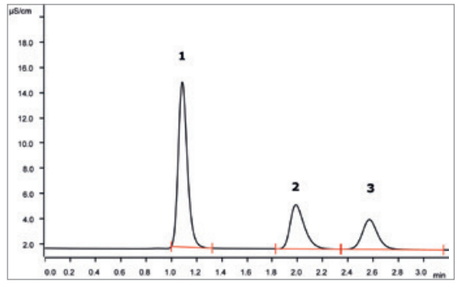
Carbonate eluent, standard, 45 °C,

		Conc. (mg/L)			Conc. (mg/L)
1	Chloride	2.00	4	Bromide	10.00
2	Nitrite	5.00	5	Nitrate	10.00
3	Phosphate	10.00	6	Sulfate	10.00



Carbonate eluent, drinking water, 45 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Chloride	10.85	3	Sulfate	5.38
2	Nitrate	8.98			



Carbonate eluent, drinking water, high flow (1.0 mL/min), 45 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Chloride	2.48	3	Sulfate	1.28
2	Nitrate	2.15			

Ordering information

Metrosep A Supp 10 - 50/2.0	6.1020.250
Metrosep A Supp 10 Guard/2.0	6.1020.600

Metrosep A Supp 10 - 75/2.0 (6.1020.270)

The Metrosep A Supp 10 - 75/2.0 separation column is based on a high-capacity poly(styrene-co-divinylbenzene) copolymer with a particle size of only 4.6 µm. This proven column concept optimized by Metrohm is characterized by its robust construction, great selectivity and outstanding separating efficiency. The 2 mm Metrosep A Supp 10 separation columns are packed with the same material as the corresponding 4 mm separation columns. Temperature, flow and eluent composition can be used to modify the properties of the column to accommodate the current application directly.

The capacity of the Metrosep A Supp 10 - 75/2.0 has been optimized with respect to two aspects: matrix and speed. A rapid baseline separation of the standard anions can also be achieved in samples of high ionic strength. Particularly suitable for IC-MS applications.

Applications

- Standard anions
- IC-MS coupling
- Separation of sulfite and sulfate
- Fermentation samples

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	75 x 2.0 mm
Column body	PEEK
Standard flow	0.25 mL/min
Maximum flow	1.1 mL/min
Maximum pressure	25 MPa
Particle size	4.6 µm
Organic modifier	0–100%
pH range	0–14
Temperature range	10–70 °C
Capacity	8 µmol (Cl^-)

Eluent

Carbonate eluent	Sodium hydrogen carbonate	840 mg/2 L	5.0 mmol/L
(standard eluent)	Sodium carbonate	1060 mg/2 L	5.0 mmol/L

Care

Regeneration

Rinse with 50 mL of a 0.05 mol/L solution of Na_4EDTA at a flow rate of 0.12 mL/min. Then rinse with 0.1 mol/L NaOH at 0.12 mL/min for 1 h.

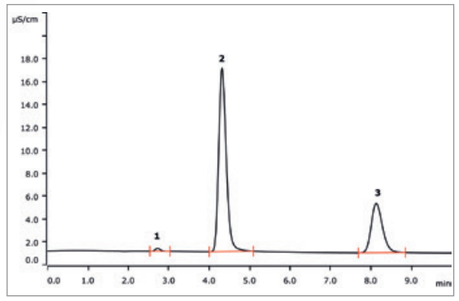
Organic contaminants:

Rinse with 70% methanol at 0.12 mL/min for 12 h. The addition of 1% acetic acid may be useful.

Storage

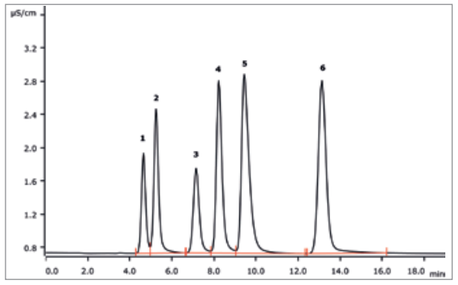
In the eluent

Chromatograms



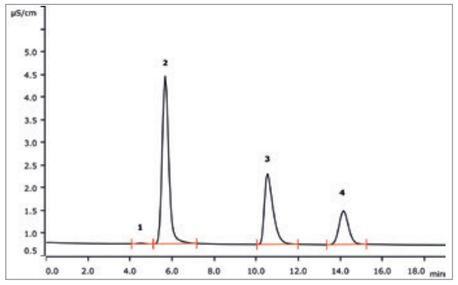
Carbonate eluent, fermentation broth Conc. (g/L)
Dilution 1 : 100, 45 °C

1	Chloride	0.025	3	Phosphate	1.249
2	Nitrite	6.461			



Carbonate eluent, standard, 45 °C, Conc. (mg/L)

1	Chloride	2.00	4	Bromide	10.00
2	Nitrite	5.00	5	Nitrate	10.00
3	Phosphate	10.00	6	Sulfate	10.00



Carbonate eluent, drinking water, 45 °C Conc. (mg/L)

1	Fluoride	n.q.	3	Nitrate	8.27
2	Chloride	9.02	4	Sulfate	4.20

Ordering information

Metrosep A Supp 10 - 75/2.0	6.1020.270
Metrosep A Supp 10 Guard/2.0	6.1020.600

Metrosep A Supp 10 - 100/2.0 (6.1020.210)

The Metrosep A Supp 10 - 100/2.0 separation column is based on a high-capacity poly(styrene-co-divinylbenzene) copolymer with a particle size of only 4.6 µm. The 2 mm Metrosep A Supp 10 separation columns are packed with the same material as the corresponding 4 mm separation columns. Temperature, flow and eluent composition can be used to modify the properties of the column to accommodate the current application directly.

The Metrosep A Supp 10 - 100/2.0 is the microbore column of choice for routine applications. Thanks to the high flow and pressure stability of this separation column, very rapid chromatograms with good separation of the ions can be achieved. The standard anions can thus be separated within less than three minutes. Particularly suitable for IC-MS applications.

Applications

- Standard anions
- Simple separation problems
- Traces of cyanide and sulfide with PAD
- Uncomplicated matrices
- IC-MS coupling

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	100 x 2.0 mm
Column body	PEEK
Standard flow	0.25 mL/min
Maximum flow	0.9 mL/min
Maximum pressure	25 MPa
Particle size	4.6 µm
Organic modifier	0–100%
pH range	0–14
Temperature range	10–70 °C
Capacity	10 µmol (Cl^-)

Eluent

Carbonate eluent (standard eluent)	Sodium hydrogen carbonate	840 mg/2 L	5.0 mmol/L
	Sodium carbonate	1060 mg/2 L	5.0 mmol/L
Hydroxide/EDTA eluent	Sodium hydroxide (c = 20 mol/L)	10 mL/2 L	100 mmol/L
	EDTA	2.0 mg/2 L	0.007 mmol/L

Care

Regeneration

Rinse with 50 mL of a 0.05 mol/L solution of Na_4EDTA at a flow rate of 0.12 mL/min. Then rinse with 0.1 mol/L NaOH at 0.12 mL/min for 1 h.

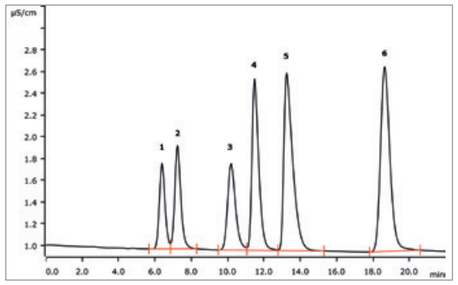
Organic contaminants:

Rinse with 70% methanol at 0.12 mL/min for 12 h. The addition of 1% acetic acid may be useful.

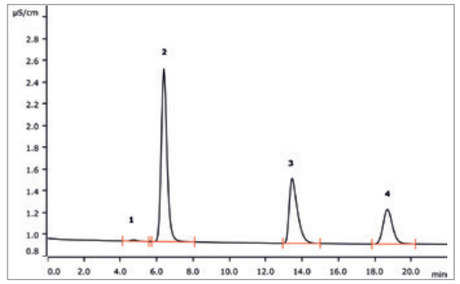
Storage

In the eluent

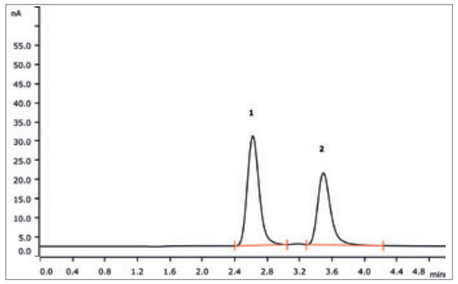
Chromatograms



Carbonate eluent, standard, 45 °C,					Conc. (mg/L)
1	Chloride	2.00	4	Bromide	10.00
2	Nitrite	5.00	5	Nitrate	10.00
3	Phosphate	10.00	6	Sulfate	10.00



Carbonate eluent, drinking water, 45 °C					Conc. (mg/L)
1	Fluoride	n.q.	3	Nitrate	10.69
2	Chloride	11.02	4	Sulfate	5.85



Hydroxide/EDTA eluent, standard, 35 °C		Conc. (µg/L)
1	Sulfide	10.00
2	Cyanide	10.00

Ordering information

Metrosep A Supp 10 - 100/2.0	6.1020.210
Metrosep A Supp 10 Guard/2.0	6.1020.600

Metrosep A Supp 10 - 150/2.0 (6.1020.220)

The Metrosep A Supp 10 - 150/2.0 separation column is based on a high-capacity poly(styrene-co-divinylbenzene) copolymer with a particle size of only 4.6 µm. This proven column concept optimized by Metrohm is characterized by its robust construction, great selectivity and outstanding separating efficiency. The 2 mm Metrosep A Supp 10 separation columns are packed with the same material as the corresponding 4 mm separation columns. Temperature, flow and eluent composition can be used to modify the properties of the column to accommodate the current application directly.

The Metrosep A Supp 10 - 150/2.0 separation column is suitable for complex separation tasks with wide differences in concentrations. The microbore version exhibits low eluent consumption and is therefore particularly suitable for IC-MS applications.

Applications

- Standard anions
- Universal applications
- Different matrices
- Transition metal complexes
- Chromium(VI) in toys (EU directive 2009/48/EC)
- IC-MS coupling

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	150 x 2.0 mm
Column body	PEEK
Standard flow	0.25 mL/min
Maximum flow	0.7 mL/min
Maximum pressure	25 MPa
Particle size	4.6 µm
Organic modifier	0–100%
pH range	0–14
Temperature range	10–70 °C
Capacity	15 µmol (Cl^-)

Eluent

Carbonate eluent (standard eluent)	Sodium hydrogen carbonate	840 mg/2 L	5.0 mmol/L
	Sodium carbonate	1060 mg/2 L	5.0 mmol/L
Dipicolinic acid eluent	Dipicolinic acid	1.0 g/2 L	3.0 mmol/L
	Sodium sulfate	1.42 g/2 L	10 mmol/L
	Sodium hydroxide (c = 20 mol/L)	6.6 mL/2 L	66 mmol/L
	Formic acid		pH = 4.33

Care

Regeneration

Column purification:

Rinse with 50 mL of a 0.05 mol/L solution of Na_4EDTA at a flow rate of 0.12 mL/min. Then rinse with 0.1 mol/L NaOH at 0.12 mL/min for 1 h.

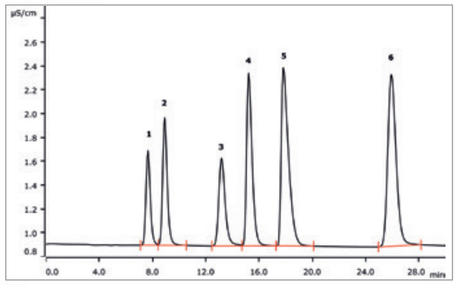
Organic contaminants:

Rinse with 70% methanol at 0.12 mL/min for 12 h. The addition of 1% acetic acid may be useful.

Storage

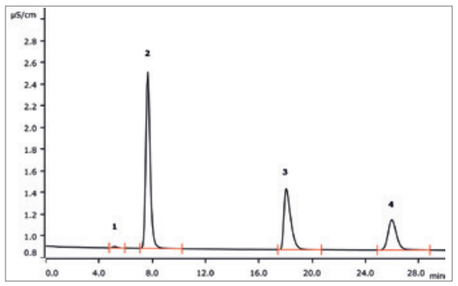
In the eluent

Chromatograms



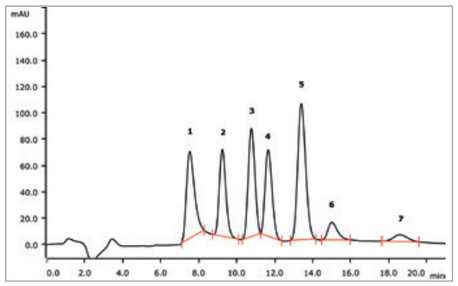
Carbonate eluent, standard, 45 °C — Conc. (mg/L)

1	Chloride	2.00	4	Bromide	10.00
2	Nitrite	5.00	5	Nitrate	10.00
3	Phosphate	10.00	6	Sulfate	10.00



Carbonate eluent, drinking water, 45 °C — Conc. (mg/L)

1	Fluoride	n.q.	3	Nitrate	10.69
2	Chloride	11.02	4	Sulfate	5.85



Dipicolinic acid eluent, PCR with PAR, 510 nm, 55 °C — Conc. (µg/L)

1	Iron(III)	12.40	5	Cobalt	10.00
2	Copper	10.00	6	Cadmium	10.00
3	Nickel	10.00	7	Iron(II)	7.5
4	Zinc	10.00			

Ordering information

Metrosep A Supp 10 - 150/2.0	6.1020.220
Metrosep A Supp 10 Guard/2.0	6.1020.600

Metrosep A Supp 10 - 250/2.0 (6.1020.230)

The Metrosep A Supp 10 - 250/2.0 separation column is based on a high-capacity poly(styrene-co-divinylbenzene) copolymer with a particle size of only 4.6 µm. This proven column concept optimized by Metrohm is characterized by its robust construction, great selectivity and outstanding separating efficiency. The 2 mm Metrosep A Supp 10 separation columns are packed with the same material as the corresponding 4 mm separation columns. Temperature, flow and eluent composition can be used to modify the properties of the column to accommodate the current application directly.

The Metrosep A Supp 10 - 250/2.0 has a very high capacity for a microbore column. It is suitable for samples with high ionic strength, for complex separation tasks and for analyses in which great differences in concentration between the individual components are present. Thanks to its low flow, this microbore separation column is ideal for IC-MS applications.

Applications

- Standard anions
- Complex separation problems
- Difficult matrices
- Anions in concentrated acids
- Aggressive matrices
- IC-MS coupling

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	250 x 2.0 mm
Column body	PEEK
Standard flow	0.25 mL/min
Maximum flow	0.7 mL/min
Maximum pressure	25 MPa
Particle size	4.6 µm
Organic modifier	0–100%
pH range	0–14
Temperature range	10–70 °C
Capacity	25 µmol (Cl^-)

Eluent

Carbonate eluent (standard eluent)	Sodium hydrogen carbonate	840 mg/2 L	5.0 mmol/L
	Sodium carbonate	1060 mg/2 L	5.0 mmol/L
Ammonium sulfate eluent	Ammonium sulfate	66.0 g/2 L	250 mmol/L
	Ammonium hydroxide (c = 5.0 mol/L)	40 mL/2 L	100 mmol/L

Care

Regeneration

Column purification:

Rinse with 50 mL of a 0.05 mol/L solution of Na_4EDTA at a flow rate of 0.12 mL/min. Then rinse with 0.1 mol/L NaOH at 0.12 mL/min for 1 h.

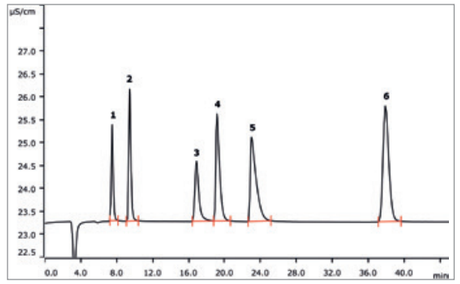
Organic contaminants:

Rinse with 70% methanol at 0.12 mL/min for 12 h. The addition of 1% acetic acid may be useful.

Storage

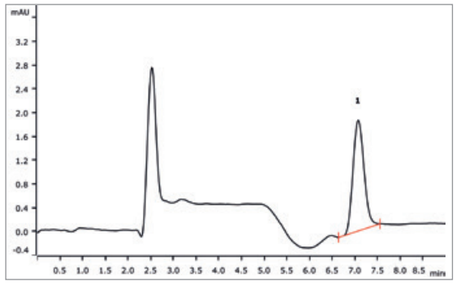
In the eluent

Chromatograms



Carbonate eluent, standard, 45 °C,

		Conc. (mg/L)			Conc. (mg/L)
1	Chloride	5.00	4	Bromide	10.00
2	Nitrite	5.00	5	Nitrate	10.00
3	Phosphate	10.00	6	Sulfate	10.00



Ammonium sulfate eluent, PCR with 1,5-diphenylcarbazide

530 nm, spiked drinking water, 50 °C

		Conc. (µg/L)
1	Chromate	0.2

Ordering information

Metrosep A Supp 10 - 250/2.0	6.1020.230
Metrosep A Supp 10 Guard/2.0	6.1020.600

Metrosep A Supp 16 - 100/2.0 (6.1031.210)

In the case of the microbore version of the Metrosep A Supp 16 - 100/2.0, lower flows are applied through the smaller inner diameter. Eluent consumption is reduced drastically as a result. The dwell time of the ions in the detector becomes longer and the sensitivity or the peak area is increased accordingly (with the same sample amount). Microbore separation columns are used together with the MSM-LC Rotor A (6.2844.000). The 2 mm Metrosep A Supp 16 separation columns are packed with the same material as the corresponding 4 mm separation columns. The short version of this column type enables extremely rapid separations.

The column is well-suited to applications with a high ionic load but which require only relatively low resolution. With its low eluent flow, this column is particularly suitable for IC-MS coupling.

Applications

- Standard anions
- Universal applications
- Rapid analysis (standard anions in 5 min)
- IC-MS coupling

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	100 x 2.0 mm
Column body	PEEK
Standard flow	0.2 mL/min
Maximum flow	0.6 mL/min
Maximum pressure	16 MPa
Particle size	4.6 µm
Organic modifier	0–10%
pH range	0–13
Temperature range	10–70 °C
Capacity	20 µmol (Cl^-)

Eluent

Carbonate/hydroxide eluent (standard eluent)	Sodium carbonate	1590 mg/2 L	7.5 mmol/L
	Sodium hydroxide (c = 0.25 mol/L)	6.0 mL/2 L	0.75 mmol/L

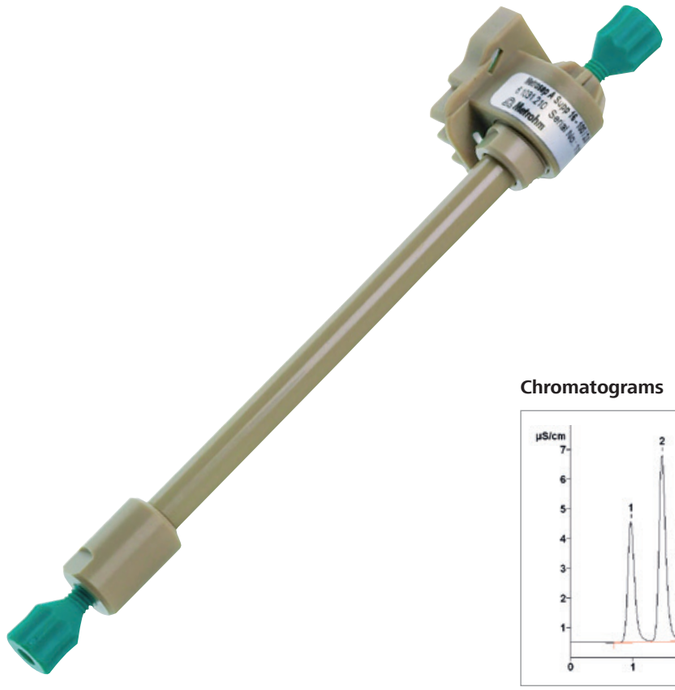
Care

Regeneration
Rinse the column overnight (12 h) with standard eluent at low flow rate (0.1 mL/min).

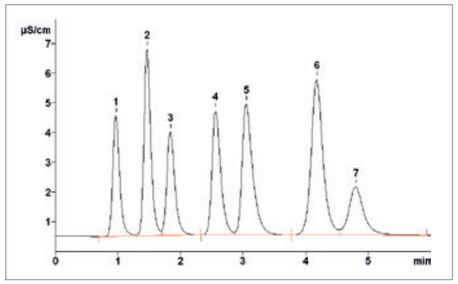
Rinse the column with half of the standard flow in the opposite direction for 2 h with 15 mmol/L Na_2CO_3 and then for 2 h with ultrapure water.

Eluent change
When installing or changing to eluents which have an organic modifier to avoid high backpressure, adjust the flow in small increments from 0.1 mL/min within one hour to match standard conditions while maintaining the direction of flow.

Storage
In the eluent

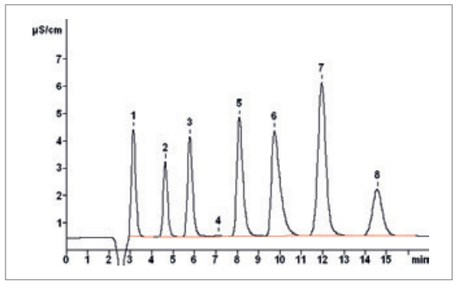


Chromatograms



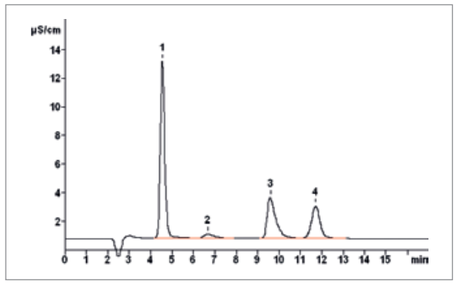
Carbonate/hydroxide eluent, standard, 40 °C, flow rate 0.6 mL/min.

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	2.00	5	Nitrate	10.0
2	Chloride	5.00	6	Sulfate	10.0
3	Nitrite	5.00	7	Phosphate	10.0
4	Bromide	10.0			



Carbonate/hydroxide eluent, standard, 45 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Fluoride	2.00	5	Bromide	10.00
2	Chloride	2.00	6	Nitrate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	System peak	–	8	Phosphate	10.00



Carbonate/hydroxide eluent, drinking water, 45 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Chloride	9.2	3	Nitrate	9.7
2	System peak	–	4	Sulfate	10.2

Ordering information

Metrosep A Supp 16 - 100/2.0	6.1031.210
Metrosep A Supp 16 Guard/2.0	6.1031.600
Metrosep A Supp 16 S-Guard/2.0	6.1031.610

Metrosep A Supp 16 - 150/2.0 (6.1031.220)

The microbore version of the Metrosep A Supp 16 - 150/2.0 is well-suited to medium-capacity separation problems. Eluent consumption is drastically reduced as a result of the smaller inner diameter of this column type and the correspondingly lower flows. As a result of the lower flows, the dwell time of the anions in the detector, and thus also the peak areas with identical sample amounts, are increased. Microbore separation columns are used together with the MSM-LC Rotor A (6.2844.000). The 2 mm Metrosep A Supp 16 separation columns are packed with the same material as the corresponding 4 mm separation columns. The medium version of this column type is used for universal applications.

The column is well-suited to applications with a high ionic load but which do not require the highest resolution. With its low eluent flow, this column is particularly suitable for IC-MS coupling.

Applications

- Standard anions
- Universal applications
- Difficult matrices with high ionic strength
- Applications with gradient
- IC-MS coupling

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	150 x 2.0 mm
Column body	PEEK
Standard flow	0.2 mL/min
Maximum flow	0.3 mL/min
Maximum pressure	16 MPa
Particle size	4.6 µm
Organic modifier	0–10%
pH range	0–13
Temperature range	10–70 °C
Capacity	29 µmol (Cl^-)

Eluent

Carbonate/hydroxide eluent (standard eluent)	Sodium carbonate	1590 mg/2 L	7.5 mmol/L
	Sodium hydroxide (c = 0.25 mol/L)	6.0 mL/2 L	0.75 mmol/L
Carbonate eluent	Sodium carbonate	763 mg/2 L	3.6 mmol/L

Care

Regeneration

Rinse the column overnight (12 h) with standard eluent at low flow rate (0.1 mL/min).

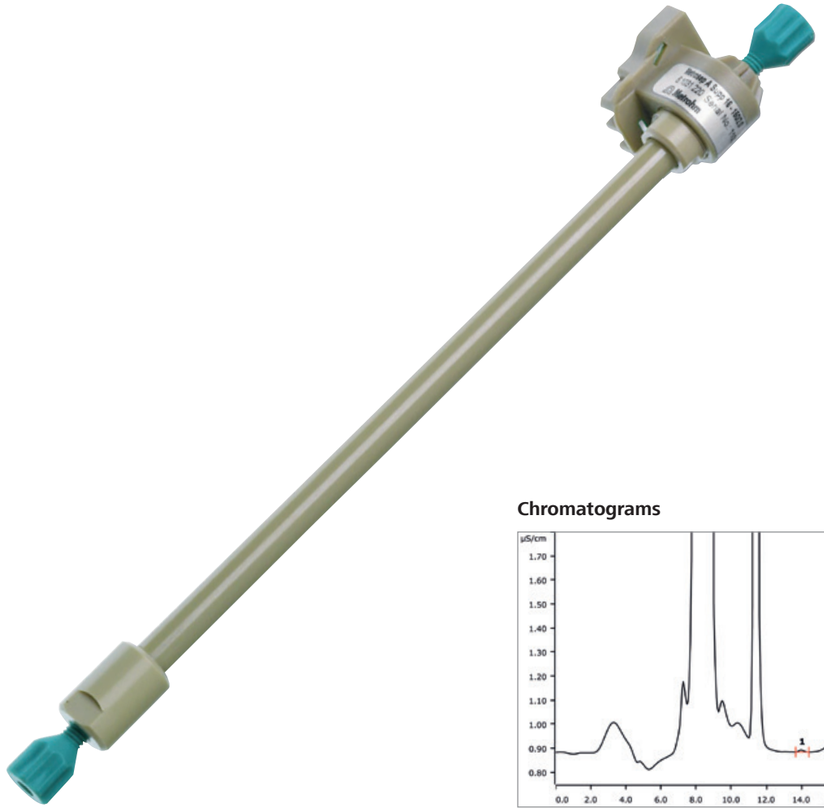
Rinse the column with half of the standard flow in the opposite direction for 2 h with 15 mmol/L Na_2CO_3 and then for 2 h with ultrapure water.

Eluent change

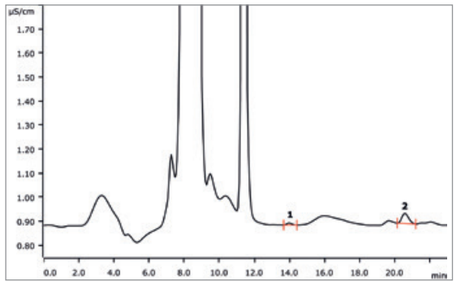
When installing or changing to eluents which have an organic modifier to avoid high backpressure, adjust the flow in small increments from 0.1 mL/min to match standard conditions within one hour while maintaining the direction of flow.

Storage

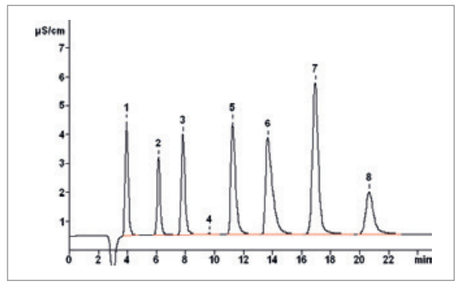
In the eluent



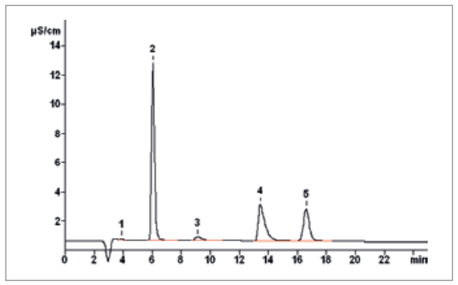
Chromatograms



Carbonate eluent, salted meat, 45 °C					Conc. (mg/L)
1	Nitrite	0.019	2	Nitrate	0.204



Carbonate/hydroxide eluent, standard, 45 °C					Conc. (mg/L)
1	Fluoride	2.00	5	Bromide	10.00
2	Chloride	2.00	6	Nitrate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	System peak	–	8	Phosphate	10.00



Carbonate/hydroxide eluent, drinking water, 45 °C					Conc. (mg/L)
1	Fluoride	n.q.	4	Nitrate	9.7
2	Chloride	9.2	5	Sulfate	10.2
3	System peak	–			

Ordering information

Metrosep A Supp 16 - 150/2.0	6.1031.220
Metrosep A Supp 16 Guard/2.0	6.1031.600
Metrosep A Supp 16 S-Guard/2.0	6.1031.610

Metrosep A Supp 16 - 250/2.0 (6.1031.230)

The microbore version of the Metrosep A Supp 16 - 250 is well suited to high-capacity separation problems. Lower flows are applied due to the smaller inner diameter of this column type. Eluent consumption is reduced drastically as a result. The dwell time of the ions in the detector becomes longer and the sensitivity or the peak area is increased accordingly (with the same sample amount). Microbore separation columns are used with the MSM-LC Rotor A (6.2844.000). The 2 mm Metrosep A Supp 16 separation columns are packed with the same material as the corresponding 4 mm separation columns. The separation column is based on a surface-functionalized poly(styrene-co-divinylbenzene) copolymer. The functional groups are bonded covalently. The morphology of the anion exchanger results in unique selectivity. The high-capacity Metrosep A Supp 16 - 250/2.0 is used for solving complex problems.

The Metrosep A Supp 16 - 250/2.0 is characterized by outstanding resolution and solves the most difficult separation problems. With its low eluent flow, this column is particularly suitable for IC-MS coupling.

Applications

- Standard anions
- Universal applications
- Azide/nitrate separation
- Divalent organic acids besides standard anions
- Matrices with high ionic strength
- Applications with gradient
- IC-MS coupling

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	250 x 2.0 mm
Column body	PEEK
Standard flow	0.2 mL/min
Maximum flow	0.3 mL/min
Maximum pressure	16 MPa
Particle size	4.6 µm
Organic modifier	0–10%
pH range	0–13
Temperature range	10–70 °C
Capacity	49 µmol (Cl^-)

Eluent

Carbonate/hydroxide eluent (standard eluent)	Sodium carbonate	1590 mg/2 L	7.5 mmol/L
	Sodium hydroxide (c = 0.25 mol/L)	6.0 mL/2 L	0.75 mmol/L

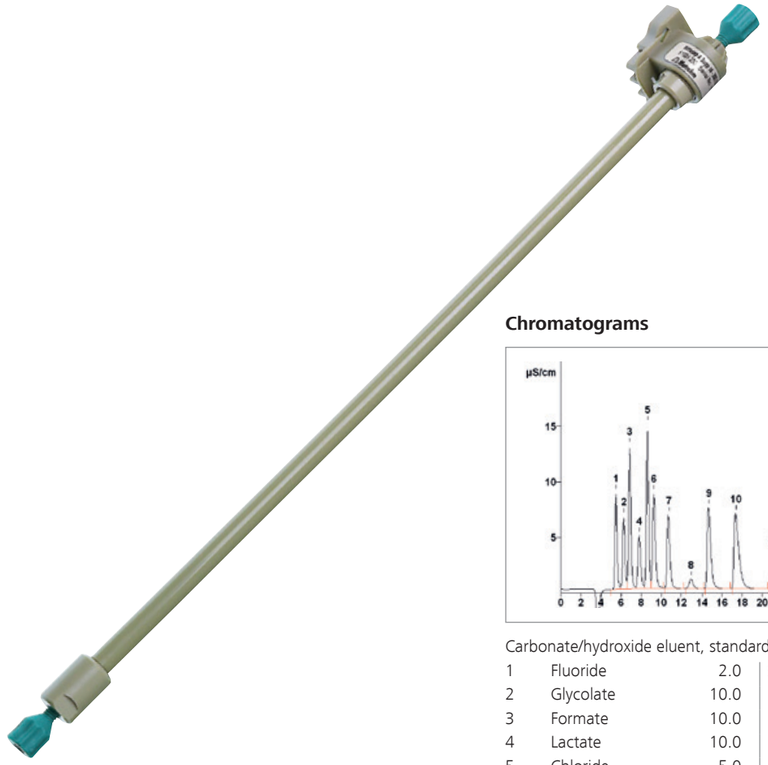
Care

Regeneration
Rinse the column overnight (12 h) with standard eluent at low flow rate (0.1 mL/min).

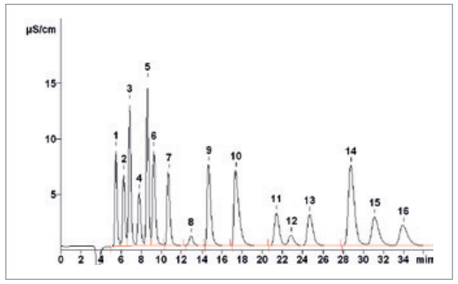
Rinse the column with half of the standard flow in the opposite direction for 2 h with 15 mmol/L Na_2CO_3 and then for 2 h with ultrapure water.

Eluent change
When installing or changing to eluents which have an organic modifier to avoid high backpressure, adjust the flow in small increments from 0.1 mL/min to match standard conditions within one hour while maintaining the direction of flow.

Storage
In the eluent

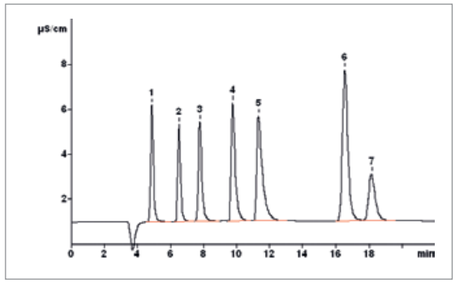


Chromatograms



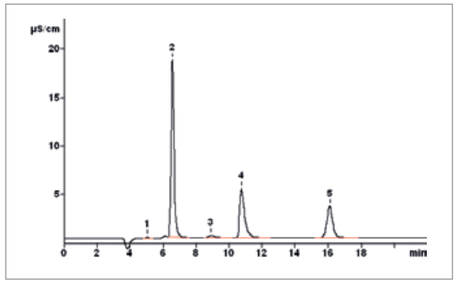
Carbonate/hydroxide eluent, standard, 65 °C — Conc. (mg/L)

1	Fluoride	2.0	9	Bromide	10.0
2	Glycolate	10.0	10	Nitrate	10.0
3	Formate	10.0	11	Malate	10.0
4	Lactate	10.0	12	Succinate	10.0
5	Chloride	5.0	13	Malonate	10.0
6	Methanesulfonate	10.0	14	Sulfate	10.0
7	Nitrite	5.0	15	Phosphate	10.0
8	System peak	–	16	Maleate	10.0



Carbonate/hydroxide eluent, standard, 45 °C — Conc. (mg/L)

1	Fluoride	2.00	5	Bromide	10.00
2	Chloride	2.00	6	Nitrate	10.00
3	Nitrite	5.00	7	Sulfate	10.00
4	System peak	–	8	Phosphate	10.00



Carbonate/hydroxide eluent, drinking water, 45 °C — Conc. (mg/L)

1	Fluoride	n.q.	4	Nitrate	9.7
2	Chloride	9.2	5	Sulfate	10.2
3	System peak	–			

Ordering information

Metrosep A Supp 16 - 250/2.0	6.1031.230
Metrosep A Supp 16 Guard/2.0	6.1031.600
Metrosep A Supp 16 S-Guard/2.0	6.1031.610

IC separation columns for the determination of organic acids – ion-exclusion chromatography

«Inverse suppression» – dissociation desired!

The use of the Metrohm MSM suppressor module is recommended to improve sensitivity in the detection of organic acids which are only weakly dissociated. A non-conventional approach is used: The suppressor is charged with lithium ions instead of hydrogen ions. As a result, it is possible to transfer the protonated and thus undissociated acids into their nearly completely dissociated salts. This increases sensitivity in the conductivity detector considerably. The construction is the same as with chemical suppression, except that the suppressor is regenerated with lithium chloride instead of with sulfuric acid. The MSM is used as a post-column reactor between the ion-exclusion column and the conductivity detector.

Hamilton PRP-X300 - 250/4.0 (6.1005.030)

The Hamilton-PRP-X300 ion-exclusion column is a cation-exchanger column with low capacity. The combination of a poly(styrene-co-divinylbenzene) copolymer with sulfonic acid groups as ion exchanger is ideal for the solution of simple separation problems. The column features the possibility of determining the salts of organic acids, in particular the very sensitive determination of formate.

Applications

- Glycolic acid, monochloroacetic acid
- Simple matrices
- Simple separation problems
- Formate determination

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with sulfonic acid groups
Column dimensions	250 x 4.0 mm
Column body	Stainless steel
Standard flow	1.0 mL/min
Maximum flow	8.0 mL/min
Maximum pressure	34 MPa
Particle size	7 µm
Organic modifier	0–100%
pH range	1–13
Temperature range	5–60 °C

Eluents

Sulfuric acid eluent	Sulfuric acid (c = 0.1 mol/L)	10 mL/2 L	0.5 mmol/L

Care

Regeneration

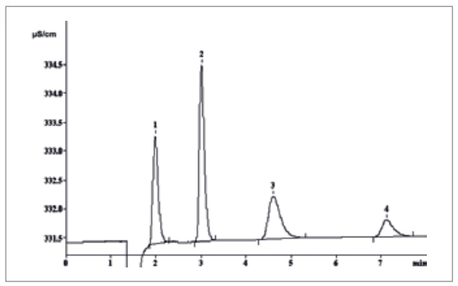
Divalent cations remain on the column and form complexes with citrate that falsify the citrate peak. Injection of 100 µL 0.1 mol/L Na_2H_2EDTA.

Rinse the column with 0.01 mol/L H_2SO_4 with 20% methanol at a flow rate of 0.5 mL/min for 6 h.

Storage

For short periods (days) in the eluent, for longer periods (weeks) in methanol/water (1:4)

Chromatogram



Sulfuric acid eluent, standard

1	Tartrate	10.00	3	Lactate	20.00
2	Formate	10.00	4	Acetate	30.00

Conc. (mg/L)

Ordering information

Hamilton PRP-X300 - 250/4.0	6.1005.030
Metrosep RP 2 Guard/3.5	6.1011.030
Metrosep RP 3 Guard HC/4.0	6.1011.040

Metrosep Organic Acids - 100/7.8 (6.1005.210)

The ion exclusion separation column for the determination of organic acids and weak mineral acids. The low capacity in comparison with the Metrosep Organic Acids - 250/7.8 (6.1005.200) allows the rapid separation of organic acids. This column is suitable primarily for small and medium concentrations in uncomplicated sample matrices.

Applications

- Organic acids: Citrate, tartrate, malate, ascorbate, succinate
- Short-chain fatty acids: Formate, acetate, propionate, butyrate, etc.
- F^-, CO_3^{2-}
- Simple matrices
- Simple separation problems

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with sulfonic acid groups
Column dimensions	100 x 7.8 mm
Column body	Stainless steel
Standard flow	0.5 mL/min
Maximum flow	0.6 mL/min
Maximum pressure	7 MPa
Particle size	9 µm
Organic modifier	0–20%
pH range	1–13
Temperature range	5–90 °C

Eluent

Sulfuric acid eluent	Sulfuric acid (c = 2 mol/L)	0.5 mL/2 L	0.5 mmol/L
(standard eluent)	Acetone	300 mL/2 L	15%
Oxalic acid eluent	Oxalic acid	45 mg/2 L	0.25 mmol/L

Care

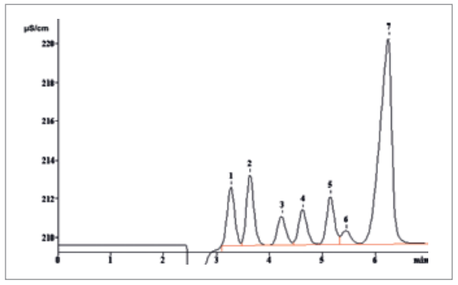
Regeneration
Column purification: Rinse the column in the opposite direction with 20% acetonitrile in 0.01 mol/L H_2SO_4 at a flow rate of 0.1 mL/min for 4 hours at 65 °C.

Contaminations with metals:
If retention times are shortened: Rinse the column in the opposite direction with approx. 30 mL 0.1 mol/L H_2SO_4 at a flow rate of 0.1 mL/min.

Organic contaminants:
Rinse the column in the opposite direction with approx. 30 mL 0.01 mol/L H_2SO_4/acetonitrile (80/20) at a flow rate of 0.1 mL/min.

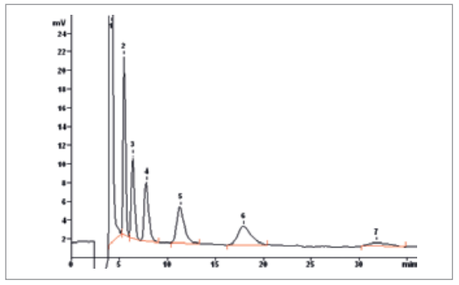
Storage
For short periods (days) in the eluent, for longer periods (weeks) in ultrapure water. The column can be stored in a refrigerator at no colder than +4 °C.

Chromatograms



Sulfuric acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Tartrate	25.0	5	Formate	20.0
2	Malate	50.0	6	Acetate	100.0
3	Succinate	100.0	7	System peak	–
4	Lactate	50.0			



Oxalic acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Acetate	10.0	5	Caproate	10.0
2	Propionate	10.0	6	Enantate	10.0
3	Butyrate	10.0	7	Octanate	10.0
4	Valerate	10.0			

Ordering information

Metrosep Organic Acids - 100/7.8	6.1005.210
Metrosep Organic Acids Guard/4.6	6.1005.250

Metrosep Organic Acids - 250/7.8 (6.1005.200)

The Metrosep Organic Acids - 250/7.8 is is a polymer-based cation-exchanger column. It is the high-performance column for the determination of organic acids and for the solution of difficult and complex separation problems. In addition, carbonate (with inverse suppression), fluoride (hydrofluoric acid), and phosphate (phosphoric acid) can be determined along with organic acids. In comparison with the Hamilton PRP-X300 - 250/4.0, the Metrosep Organic Acids column - 250/7.8 has greater capacity and enhanced selectivity.

Applications

- Organic acids: Citrate, tartrate, malate, ascorbate, succinate
- Short-chain fatty acids: Formate, acetate, propionate, butyrate, etc.
- F^-, PO_4^{3-}, CO_3^{2-}
- Difficult matrices
- Difficult separation problems

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with sulfonic acid groups
Column dimensions	250 x 7.8 mm
Column body	Stainless steel
Standard flow	0.5 mL/min
Maximum flow	0.6 mL/min
Maximum pressure	7 MPa
Particle size	9 µm
Organic modifier	0–20%
pH range	1–13
Temperature range	5–90 °C

Eluent

Sulfuric acid eluent (standard eluent)	Sulfuric acid (c = 2 mol/L)	0.5 mL/2 L	0.5 mmol/L
	Acetone	300 mL/2 L	15%

Care

Regeneration

Column purification: Rinse the column in the opposite direction with 20% acetonitrile in 0.01 mol/L H_2SO_4 at a flow rate of 0.1 mL/min for 4 hours at 65 °C.

Contaminations with metals:

If retention times are shortened: Rinse the column in the opposite direction with approx. 30 mL 0.1 mol/L H_2SO_4 at a flow rate of 0.1 mL/min.

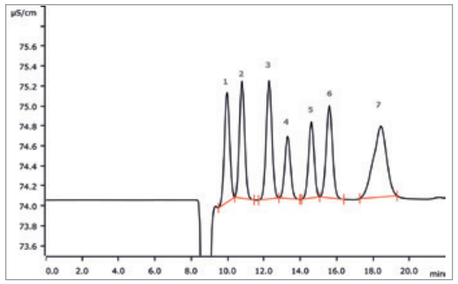
Organic contaminants:

Rinse the column in the opposite direction with approx. 30 mL 0.01 mol/L H_2SO_4/acetonitrile (80/20) at a flow rate of 0.1 mL/min.

Storage

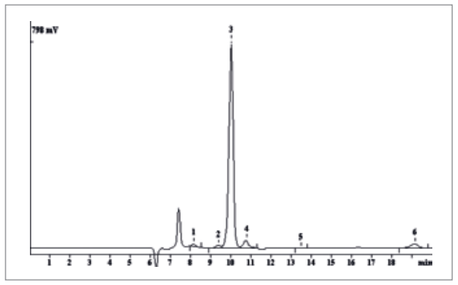
For short periods (days) in the eluent, for longer periods (weeks) in ultrapure water. The column can be stored in a refrigerator at no colder than +4 °C.

Chromatograms



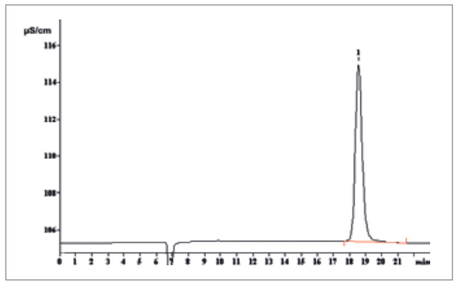
Sulfuric acid eluent, standard with inverse suppression — Conc. (mg/L)

1	Tartrate	10.00	5	Formate	5.00
2	Malate	10.00	6	Acetate	10.00
3	Succinate	10.00	7	System peak	–
4	Lactate	10.00			



Sulfuric acid eluent, apple juice — Conc. (mg/L)

1	Citrate	63.41	4	unknown	–
2	Tartrate	48.14	5	Lactate	29.86
3	Malate	7281.28	6	System peak	–



Sulfuric acid eluent, mineral water — Conc. (mg/L)

1	Carbonate	304

Ordering information

Metrosep Organic Acids - 250/7.8	6.1005.200
Metrosep Organic Acids Guard/4.6	6.1005.250

Separation columns

IC carbohydrate-separation columns – anion-exchange chromatography applying pulsed amperometric detection (PAD)

Metrosep Carb 2 - 100/4.0 (6.1090.410)

The Metrosep Carb 2 - 100/4.0 IC column is particularly suitable for the determination of carbohydrates using alkaline eluents and pulsed amperometric detection. The high-capacity anion exchange column is based on a poly(styrene-co-divinylbenzene) copolymer. It is stable in the range of pH = 0–14 and provides separation of glucose, fructose, sucrose and lactose. It is also suitable for the analysis of some sugar alcohols and oligosaccharides. Short analysis times can be achieved on the 100 mm version of the Metrosep Carb 2 separation column.

Applications

- Monosaccharides
- Disaccharides
- Sugar alcohols
- Oligosaccharides
- Simple separation problems
- Very rapid separations

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	100 x 4.0 mm
Column body	PEEK
Standard flow	0.8 mL/min
Maximum flow	1.6 mL/min
Maximum pressure	20 MPa
Particle size	5.0 µm
Organic modifier	In the eluent: 0–50 % acetonitrile or methanol In the sample: 0–100 % acetone, acetonitrile or methanol
pH range	0–14
Temperature range	20–60 °C

Eluent

Hydroxide/acetate eluent (standard eluent)	Sodium hydroxide (c = 20 mol/L)	10 mL/2 L 1640.7 mg/2 L	100 mmol/L 10 mmol/L

Note

1. Use a flow ramp to establish the standard flow in the column within 5 min.
2. Rinse the column with the desired eluent for 2 h at 30 °C.

Care

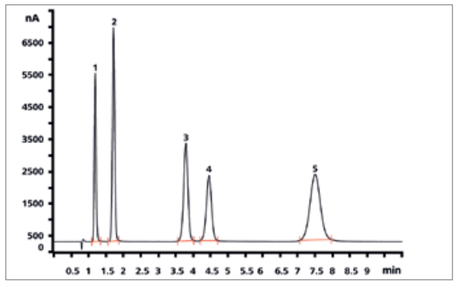
Organic contamination:
Rinse the column in the flow direction with standard eluent in 50% acetonitrile at a flow rate of 0.5 mL/min for 3 h.

Inorganic contamination:
Rinse the column in the flow direction with a mixture of 100 mmol/L sodium hydroxide and 500 mmol/L sodium acetate at a flow rate of 0.5 mL/min for at least 3 h.

After regeneration, rinse the column with standard eluent for at least 3 h.

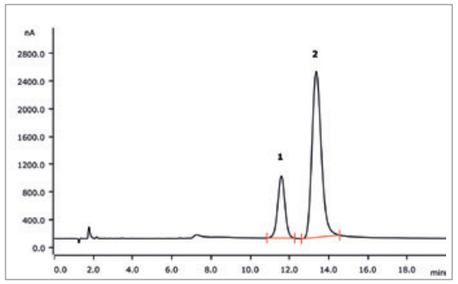
Storage
In the standard eluent

Chromatograms



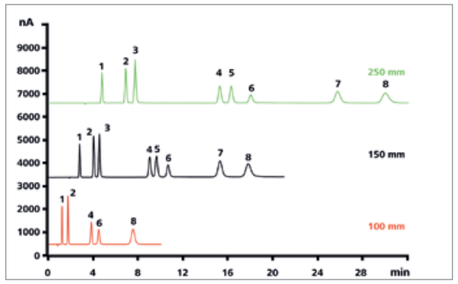
Hydroxide/acetate eluent, standard, 30 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Inositol	2.5	4	Fructose	5.0
2	Arabitol	5.0	5	Sucrose	15.0
3	Glucose	5.0			



Hydroxide/acetate eluent, whole milk chocolate, 60 mg/L in 10% acetone, 30 °C

		Conc. (g/kg)			Conc. (g/kg)
1	Lactose	101.6	2	Sucrose	400.7



Hydroxide/acetate eluent, standard, comparison of the various column lengths

		Conc. (mg/L)			Conc. (mg/L)
1	Inositol	2.5	5	Xylose	5.0
2	Arabitol	5.0	6	Fructose	5.0
3	Sorbitol	5.0	7	Lactose	10.0
4	Glucose	5.0	8	Sucrose	15.0

Ordering information

Metrosep Carb 2 - 100/4.0	6.1090.410
Metrosep Carb 2 Guard/4.0	6.1090.500
Metrosep Carb 2 S-Guard/4.0	6.1090.510

Metrosep Carb 2 - 150/4.0 (6.1090.420)

The Metrosep Carb 2 - 150/4.0 IC column is particularly suitable for the determination of carbohydrates using alkaline eluents and pulsed amperometric detection. The anion exchange column is based on a poly(styrene-co-divinylbenzene) copolymer. It is stable in the range of pH = 0–14 and provides separation of monosaccharides and disaccharides. It is also suitable for the analysis of sugar alcohols, anhydrous sugars, oligosaccharides, etc. The column capacity has been optimized to enable the combination of rapid separations and excellent separation properties.

Applications

- Monosaccharides
- Disaccharides
- Sugar alcohols
- Anhydrosugars
- Oligosaccharides
- Rapid separations

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	150 x 4.0 mm
Column body	PEEK
Standard flow	0.5 mL/min
Maximum flow	1.2 mL/min
Maximum pressure	20 MPa
Particle size	5.0 µm
Organic modifier	In the eluent: 0–50 % acetonitrile or methanol In the sample: 0–100 % acetone, acetonitrile or methanol
pH range	0–14
Temperature range	20–60 °C

Eluent

Hydroxide/acetate eluent (standard eluent)	Sodium hydroxide (c = 20 mol/L) Sodium acetate	10 mL/2 L 1640.7 mg/2 L	100 mmol/L 10 mmol/L
Hydroxide eluent	Sodium hydroxide (c = 20 mol/L)	1.0 mL/2 L	20 mmol/L
Hydroxide/acetate eluent (modified)	Sodium hydroxide (c = 20 mol/L) Sodium acetate	0.5 mL/2 L 328.1 mg/2 L	5 mmol/L 2 mmol/L
Hydroxide eluent (modified)	Sodium hydroxide (c = 20 mol/L)	5.0 mL/2 L	100 mmol/L

Note

1. Use a flow ramp to establish the standard flow in the column within 5 min.
2. Rinse the column for 2 h at 30 °C with the desired eluent.

Care

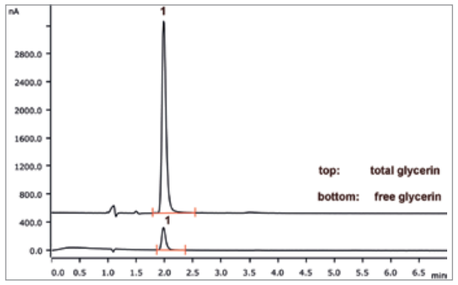
Organic contamination:
Rinse the column in the flow direction with standard eluent in 50% acetonitrile at a flow rate of 0.5 mL/min for 3 h.

Inorganic contamination:
Rinse the column in the flow direction with a mixture of 100 mmol/L sodium hydroxide and 500 mmol/L sodium acetate at a flow rate of 0.5 mL/min for at least 5 h.

After regeneration, rinse the column with standard eluent for at least 5 h.

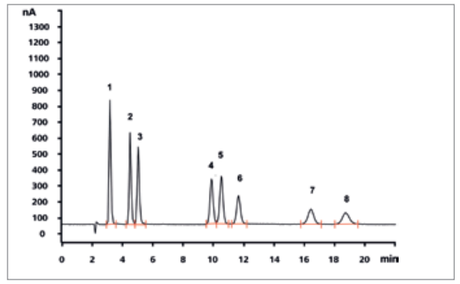
Storage
In the standard eluent

Chromatograms



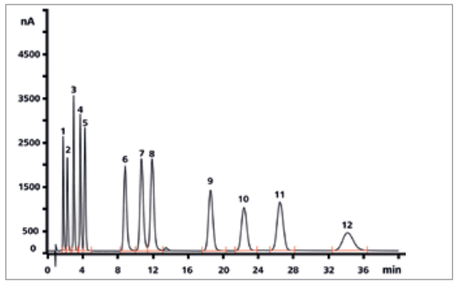
Hydroxide eluent, (modified), ASTM D 7591, free and total glycerin in biodiesel — Conc. (mg/kg)

1	Free glycerin	6.52	2	Total glycerin	98.15



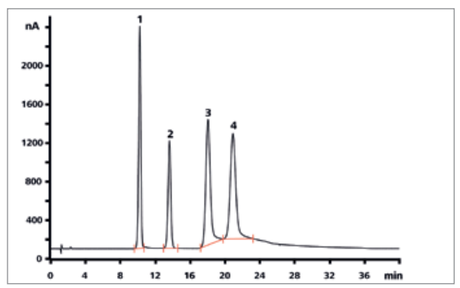
Hydroxide/acetate eluent, standard, 30 °C — Conc. (mg/L)

1	Inositol	1.0	5	Xylose	1.0
2	Arabitol	1.0	6	Fructose	1.0
3	Sorbitol	1.0	7	Lactose	1.0
4	Glucose	1.0	8	Sucrose	1.0



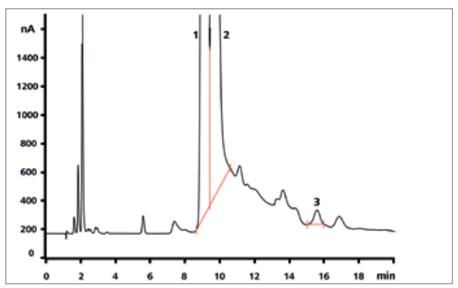
Hydroxide eluent, standard, anhydrosugars in aerosols, 45 °C — Conc. (mg/L)

1	Inositol	0.6	7	Mannosan	3.2
2	Erythritol	0.6	8	Galactosan	3.2
3	Arabitol	1.3	9	Rhamnose	3.2
4	Sorbitol	1.3	10	Glucose	3.2
5	Mannitol	1.3	11	Xylose	3.2
6	Levoglucosan	3.2	12	Sucrose	3.2



Hydroxide/acetate eluent, (mod.), standard, 35 °C — Conc. (mg/L)

1	Galactose	5.0	4	N-acetyl-galactosamine	20.0
2	Mannose	5.0			
3	N-acetyl-glucosamine	20.0			



Hydroxide/acetate eluent, (mod.), lactose-free milk, diluted 1 : 100, Inline Dialysis spiked with 100 mg/L Lactose, 28 °C — Conc. (mg/L)

1	Galactose	n.q.	3	Lactose	100.0
2	Glucose	n.q.			

Ordering information

Metrosep Carb 2 - 150/4.0	6.1090.420
Metrosep Carb 2 Guard/4.0	6.1090.500
Metrosep Carb 2 S-Guard/4.0	6.1090.510

Metrosep Carb 2 - 250/4.0 (6.1090.430)

The Metrosep Carb 2 - 250/4.0 IC column is particularly suitable for the determination of carbohydrates using alkaline eluents and pulsed amperometric detection. The high-capacity anion exchange column is based on a poly(styrene-co-divinylbenzene) copolymer. It is stable in the range of pH = 0–14 and provides separation of monosaccharides and disaccharides. It is also suitable for the analysis of sugar alcohols, anhydrous sugars, amino sugars, etc. The 250 mm version of the Metrosep Carb 2 separation column is optimized for complex separations.

Applications

- Monosaccharides
- Disaccharides
- Sugar alcohols
- Anhydrosugars
- Difficult matrices
- Complex separations

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	0.5 mL/min
Maximum flow	0.8 mL/min
Maximum pressure	20 MPa
Particle size	5.0 µm
Organic modifier	In the eluent: 0–50 % acetonitrile or methanol In the sample: 0–100 % acetone, acetonitrile or methanol
pH range	0–14
Temperature range	20–60 °C

Eluent

Hydroxide/acetate eluent (standard eluent)	Sodium hydroxide (c = 20 mol/L) Sodium acetate	10 mL/2 L 1640.7 mg/2 L	100 mmol/L 10 mmol/L
Hydroxide/acetate eluent (modified)	Sodium hydroxide (c = 20 mol/L) Sodium acetate	0.5 mL/2 L 328.1 mg/2 L	5 mmol/L 2 mmol/L

Note

1. Use a flow ramp to establish the standard flow in the column within 5 min.
2. Rinse the column with the desired eluent for 2 h at 30 °C.

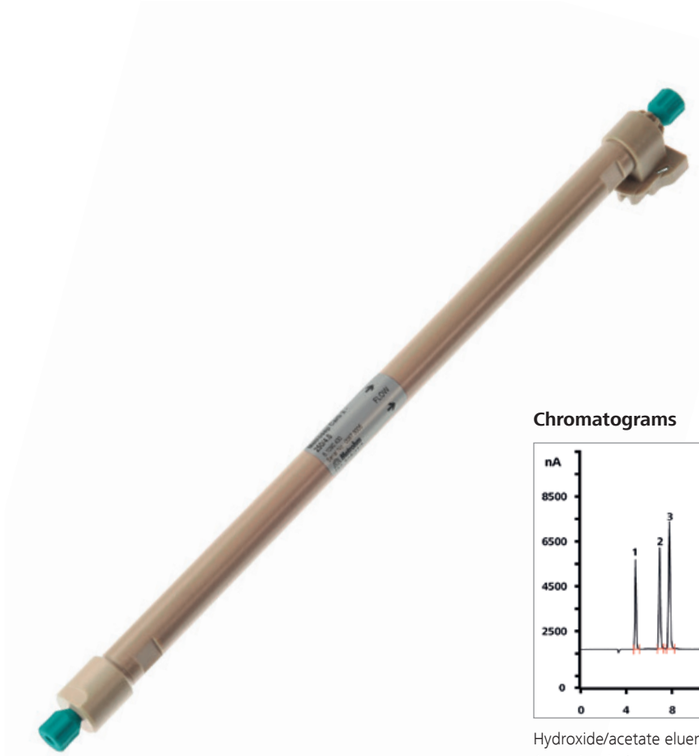
Care

Organic contamination:
Rinse the column in the flow direction with standard eluent in 50% acetonitrile at a flow rate of 0.5 mL/min for 7 h.

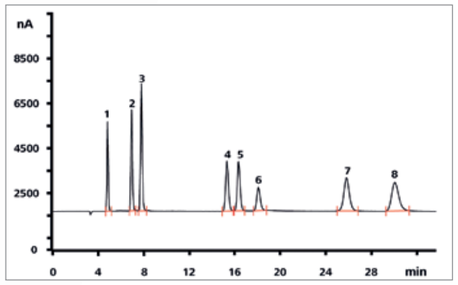
Inorganic contamination:
Rinse the column in the flow direction with a mixture of 100 mmol/L sodium hydroxide and 500 mmol/L sodium acetate at a flow rate of 0.5 mL/min for at least 7 h.

After regeneration, rinse the column with standard eluent for at least 7 h.

Storage
In the standard eluent

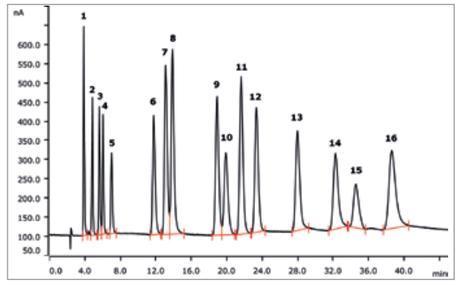


Chromatograms



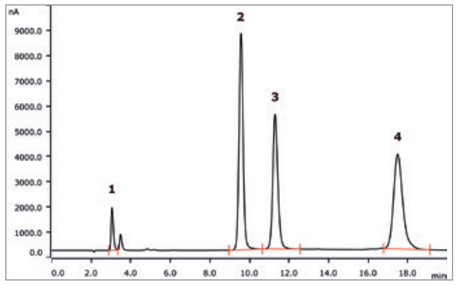
Hydroxide/acetate eluent, standard, 30 °C — Conc. (mg/L)

1	Inositol	2.5	5	Xylose	5.0
2	Arabitol	5.0	6	Fructose	5.0
3	Sorbitol	5.0	7	Lactose	10.0
4	Glucose	5.0	8	Sucrose	15.0



Hydroxide/acetate eluent, (mod.), standard, 40 °C — Conc. (mg/L)

1	Inositol	0.5	9	Fucose	2.0
2	Xylitol	0.5	10	Sucrose	2.0
3	Sorbitol	0.5	11	Galactose	2.0
4	Mannitol	0.5	12	Glucose	2.0
5	Lactitol	0.5	13	Mannose	2.0
6	Levoglucosan	2.0	14	Sorbose	5.0
7	Mannosan	2.0	15	Fructose	5.0
8	Galactosan	2.0	16	Lactose	5.0



Hydroxide/acetate eluent, orange juice — Conc. (g/L)

1	Inositol	1.5	5	Fructose	23.2
2	Glucose	20.6	6	Sucrose	42.5

Ordering information

Metrosep Carb 2 - 250/4.0	6.1090.430
Metrosep Carb 2 Guard/4.0	6.1090.500
Metrosep Carb 2 S-Guard/4.0	6.1090.510

Hamilton RCX-30 - 250/4.6 (6.1018.000)

The Hamilton RCX-30 - 250/4.6 is a column for the separation of monosaccharides, disaccharides, and sugar alcohols. It is an anion exchange column based on poly(styrene-co-divinylbenzene) resin. The Hamilton RCX-30 - 250/4.6 can be used for universal applications.

The Hamilton RCX-30 - 250/4.6 separation column excels in an outstanding separation of fructose and lactose. The column also offers the advantage that flows of up to 2 mL/min can be used in order to accelerate the chromatography. It is preferred for the determination of small carbohydrates (monosaccharides, disaccharides, and sugar alcohols).

Applications

- Monosaccharides
- Disaccharides
- Sugar alcohols
- Difficult separation problems
- Difficult matrices

Technical information

Substrate	Poly(styrene-co-divinylbenzene) copolymer with quaternary ammonium groups
Column dimensions	250 x 4.6 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	2.0 mL/min
Maximum pressure	34 MPa
Particle size	7 µm
pH range	1–13 (T>35 °C max. pH 8)
Temperature range	20–60 °C

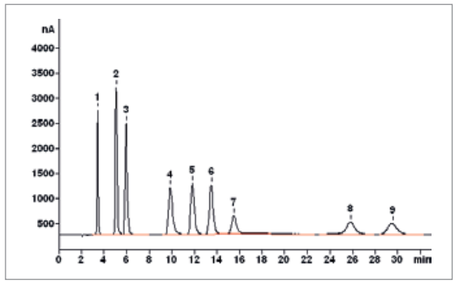
Eluent

Hydroxide eluent (standard eluent)	Sodium hydroxide (c = 20 mol/L)	15 mL/2 L	150 mmol/L

Care

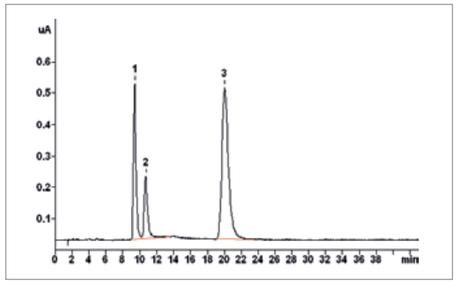
Regeneration	Storage
Rinse the column with 150 mL 0.1 mol/L NaOH at a flow rate of 1 mL/min.	In ultrapure water with 1 mmol/L sodium azide

Chromatograms



Hydroxide eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Inositol	5.00	6	Glucose	10.00
2	Arabitol	10.00	7	Fructose	10.00
3	Sorbitol	10.00	8	Lactose	10.00
4	Fucose	10.00	9	Sucrose	10.00
5	Arabinose	10.00			



Hydroxide eluent, banana 1.1 g/2 L

		Conc. (mg/g)			Conc. (mg/g)
1	Glucose	15	3	Sucrose	71
2	Fructose	11			

Ordering information

Hamilton RCX-30 - 250/4.6	6.1018.000
Metrosep RP 2 Guard/3.5	6.1011.030
Metrosep RP 3 Guard HC/4.0	6.1011.040

Separation columns

Microbore IC carbohydrate-separation columns for lower eluent consumption and greater sensitivity

Metrosep Carb 2 - 100/2.0 (6.01090.210)

The Metrosep Carb 2 - 100/2.0 column is the short microbore version of the Metrosep Carb 2 columns and is particularly suitable for the determination of carbohydrates using alkaline eluents and pulsed amperometric detection. The high-capacity anion exchanger column is based on a poly(styrene-co-divinylbenzene) copolymer. It is stable in the range of pH = 0–14 and provides separation of glucose, fructose, and sucrose. It is also suitable for the analysis of some sugar alcohols and oligosaccharides. Short analysis times can be achieved on the 100 mm version of the Metrosep Carb 2 separation column.

With its low eluent flow, this column is particularly suitable for IC-MS coupling.

Applications

- Monosaccharides
- Disaccharides
- Sugar alcohols
- Oligosaccharides
- Simple separation problems
- Very rapid separations
- Anions in sea water
- IC-MS

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	100 x 2.0 mm
Column body	PEEK
Standard flow	0.2 mL/min
Maximum flow	0.7 mL/min
Maximum pressure	20 MPa
Particle size	5.0 µm
Organic modifier	In the eluent: 0–50 % acetonitrile or methanol In the sample: 0–100 % acetone, acetonitrile or methanol
pH range	0–14
Temperature range	20–60 °C

Eluents

Hydroxide/acetate eluent (standard eluent)	Sodium hydroxide (c = 20 mol/L)	10 mL/2 L	100 mmol/L
	Sodium acetate	1640.7 mg/2 L	10 mmol/L
Sodium chloride eluent	Sodium chloride	20 g/2 L	10 g/L
Ammonium nitrate eluent	Ammonium nitrate Ammonium hydroxide	16.0 g/2 L	100 mmol/L pH = 9.0

Care

Regeneration

Note:

1. Use a flow ramp to establish the standard flow in the column within 5 min.
2. Rinse the column with the desired eluent for 2 h at 30 °C.

Organic contamination:

Rinse the column in the flow direction with 25 mL of solution (standard eluent in 50% acetonitrile) at a flow rate of 0.13 mL/min.

Inorganic contamination:

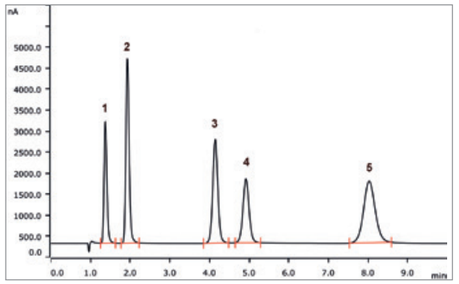
Rinse the column in the flow direction with a mixture of 100 mmol/L sodium hydroxide and 500 mmol/L sodium acetate at a flow rate of 0.13 mL/min for at least 7 h.

After regeneration, rinse the column with standard eluent for at least 7 h.

Storage

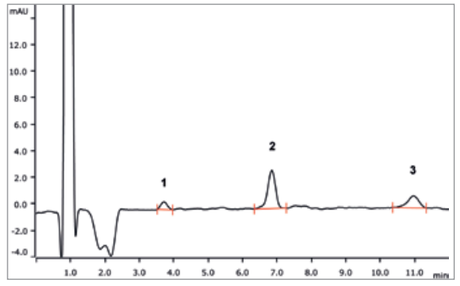
In the standard eluent

Chromatograms



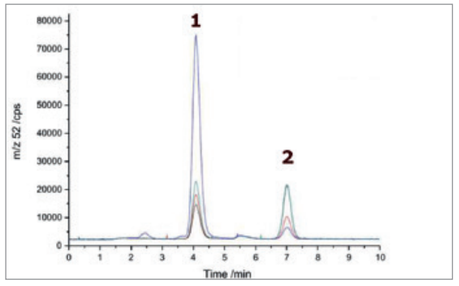
Hydroxide/acetate eluent, standard, 30 °C — Conc. (mg/L)

1	Inositol	2.5	4	Fructose	5.0
2	Arabitol	5.0	5	Sucrose	15.0
3	Glucose	5.0			



Sodium chloride eluent, modified, artificial seawater, UV/VIS, 30 °C — Conc. (mg/L)

1	Nitrite	0.08	3	Nitrate	0.34
2	Bromide	0.69			



Ammonium nitrate eluent, standard, IC-ICP/MS — Conc. (µg/L)

1	Cr(III)	0.6, 0.8, 1.0, 4.0	2	Cr(VI)	0.2, 0.4, 1.0

Ordering information

Metrosep Carb 2 - 100/2.0	6.01090.210
Metrosep Carb 2 Guard/2.0	6.01090.600

Metrosep Carb 2 - 150/2.0 (6.01090.220)

The Metrosep Carb 2 - 150/2.0 microbore column is particularly suitable for the determination of carbohydrates using alkaline eluents and pulsed amperometric detection. The anion exchanger column is based on a poly(styrene-co-divinylbenzene) copolymer. It is stable in the range of pH = 0–14 and separates monosaccharides and disaccharides. It is also suitable for the analysis of sugar alcohols, anhydrous sugars, oligosaccharides, etc. The column capacity has been optimized to enable the combination of rapid separations and excellent separation properties.

Thanks to its low eluent consumption, it is particularly suitable for IC-MS coupling.

Applications

- Monosaccharides
- Disaccharides
- Sugar alcohols
- Oligosaccharides
- Anhydrous sugars
- Rapid separations
- IC-MS

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	150 x 2.0 mm
Column body	PEEK
Standard flow	0.13 mL/min
Maximum flow	0.45 mL/min
Maximum pressure	20 MPa
Particle size	5.0 µm
Organic modifier	In the eluent: 0–50 % acetonitrile or methanol In the sample: 0–100 % acetone, acetonitrile or methanol
pH range	0–14
Temperature range	20–60 °C

Eluents

Hydroxide/acetate eluent (standard eluent)	Sodium hydroxide (c = 20 mol/L)	10 mL/2 L	100 mmol/L
	Sodium acetate	1640.7 mg/2 L	10 mmol/L
Hydroxide/acetate eluent (modified)	Sodium hydroxide (c = 20 mol/L)	0.5 mL/2 L	5 mmol/L
	Sodium acetate	328.1 mg/2 L	2 mmol/L

Care

Regeneration

Note:

1. Use a flow ramp to establish the standard flow in the column within 5 min.
2. Rinse the column with the desired eluent for 2 h at 30 °C.

Organic contamination:

Rinse the column in the flow direction with 25 mL of solution (standard eluent in 50% acetonitrile) at a flow rate of 0.13 mL/min.

Inorganic contamination:

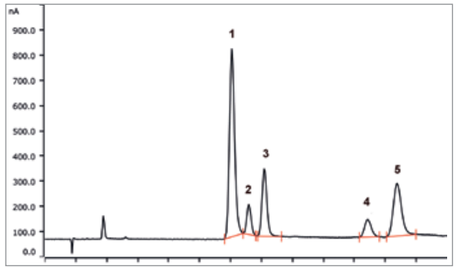
Rinse the column in the flow direction with a mixture of 100 mmol/L sodium hydroxide and 500 mmol/L sodium acetate at a flow rate of 0.13 mL/min for at least 7 h.

After regeneration, rinse the column with standard eluent for at least 7 h.

Storage

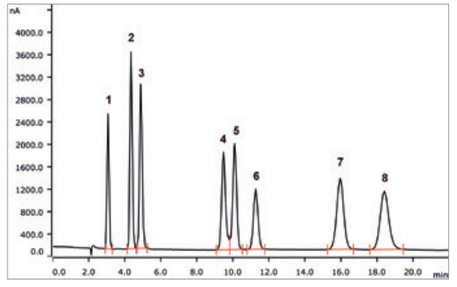
In the standard eluent

Chromatograms



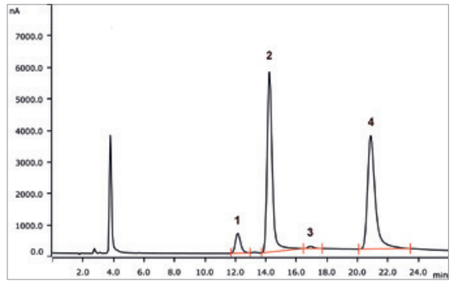
Hydroxide/acetate eluent, (mod.), yoghurt, 1:1000 diluted, 40 °C

		Conc. (g/L)			Conc. (g/L)
1	Sucrose	64.5	4	Fructose	15.2
2	Galactose	4.2	5	Lactose	30.6
3	Glucose	10.0			



Hydroxide/acetate eluent, standard, 30 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Inositol	2.5	5	Xylose	5.0
2	Arabitol	5.0	6	Fructose	5.0
3	Sorbitol	5.0	7	Lactose	10.0
4	Glucose	5.0	8	Sucrose	15.0



Hydroxide/acetate eluent, (mod.), apple juice, 1:1000 diluted, 40 °C

		Conc. (g/L)			Conc. (g/L)
1	Sucrose	5.0	3	unknown	–
2	Glucose	26.8	4	Fructose	59.4

Ordering information

Metrosep Carb 2 - 150/2.0	6.01090.220
Metrosep Carb 2 Guard/2.0	6.01090.600

Metrosep Carb 2 - 250/2.0 (6.01090.230)

The Metrosep Carb 2 - 250/2.0 column is particularly suitable for the determination of carbohydrates using alkaline eluents and pulsed amperometric detection. The high-capacity anion exchanger column is based on a poly(styrene-co-divinylbenzene) copolymer. It is stable in the range of pH = 0–14 and separates monosaccharides and disaccharides. It is also suitable for the analysis of sugar alcohols, anhydrous sugars, amino sugars, etc. The 250 mm microbore version of the Metrosep Carb 2 separation column is optimized for complex separations.

Thanks to its low eluent consumption, it is particularly suitable for IC-MS coupling.

Applications

- Monosaccharides
- Disaccharides
- Sugar alcohols
- Anhydrous sugars
- Oligosaccharides
- Difficult matrices
- Complex separations
- IC-MS

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	250 x 2.0 mm
Column body	PEEK
Standard flow	0.13 mL/min
Maximum flow	0.30 mL/min
Maximum pressure	20 MPa
Particle size	5.0 µm
Organic modifier	In the eluent: 0–50 % acetonitrile or methanol In the sample: 0–100 % acetone, acetonitrile or methanol
pH range	0–14
Temperature range	20–60 °C

Eluents

Hydroxide/acetate eluent (standard eluent)	Sodium hydroxide (c = 20 mol/L)	10 mL/2 L	100 mmol/L
	Sodium acetate	1640.7 mg/2 L	10 mmol/L
Hydroxid eluent	Sodium hydroxide	1.0 mL/2 L	10 mmol/L

Care

Regeneration

Note:

1. Use a flow ramp to establish the standard flow in the column within 5 min.
2. Rinse the column with the desired eluent for 2 h at 30 °C.

Organic contamination:

Rinse the column in the flow direction with 25 mL of solution (standard eluent in 50% acetonitrile) at a flow rate of 0.13 mL/min.

Inorganic contamination:

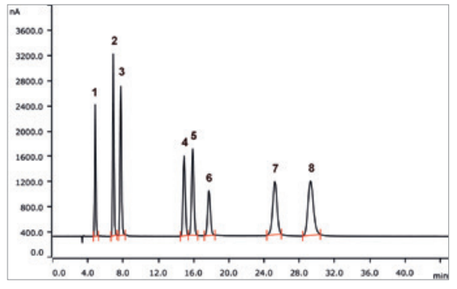
Rinse the column in the flow direction with a mixture of 100 mmol/L sodium hydroxide and 500 mmol/L sodium acetate at a flow rate of 0.13 mL/min for at least 7 h.

After regeneration, rinse the column with standard eluent for at least 7 h.

Storage

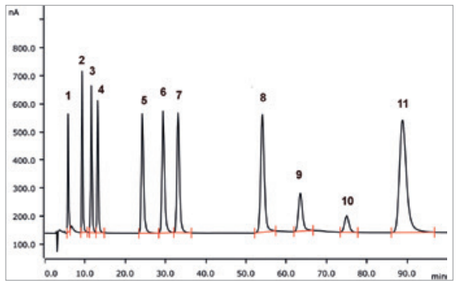
In the standard eluent

Chromatograms



Hydroxide/acetate, 30 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Inositol	2.5	5	Xylose	5.0
2	Arabitol	5.0	6	Fructose	5.0
3	Sorbitol	5.0	7	Lactose	10.0
4	Glucose	5.0	8	Sucrose	15.0



Hydroxide eluent, Anhydrosugars, 45 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Inositol	0.25	7	Galactosan	1.25
2	Arabitol	0.50	8	Rhamnose	2.50
3	Sorbitol	0.50	9	Glucose	3.75
4	Mannitol	0.50	10	Xylose	3.75
5	Levoglucosan	1.25	11	Sucrose	3.75
6	Mannosan	1.25			

Ordering information

Metrosep Carb 2 - 250/2.0	6.01090.230
Metrosep Carb 2 Guard/2.0	6.01090.600

Separation columns

IC amino acid-separation column with optical detection (VIS) after post-column reaction

Metrosep Amino Acids 1 - 100/4.0 (6.4001.410)

The Metrosep Amino Acids 1 - 100/4.0 is the standard separation column for amino acids. The column is based on a sulfonated poly(styrene-co-divinylbenzene) material. The determination of amino acids is accomplished by means of photometric detection following a post-column reaction with ninhydrin.

The Metrosep Amino Acids 1 - 100/4.0 permits the separation of up to 44 amino acids in research and routine applications, including all naturally occurring amino acids.

Applications
- Amino acids
- Ammonium

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with sulfonic acid groups, lithium form
Column dimensions	100 x 4.0 mm
Column body	Stainless steel
Standard flow	0.4 mL/min
Maximum flow	0.5 mL/min
Maximum pressure	10 MPa
Particle size	5 µm
Organic modifier	10% acetonitrile, 0–5% other organic solvents
pH range	1–14
Temperature range	30–90 °C
Capacity	2.9 mmol (K^+)

Eluents

Citrate/phenol eluent	A:	Lithium citrate	17.8 g/2 L	42.6 mmol/L
Gradient		Phenol	2.0 g/2L	10.6 mmol/L
		HCl		pH = 2.8
	B:	Lithium citrate	17.8 g/2L	42.6 mmol/L
		Lithium chloride	86.0 g/2L	1.0 mol/L
		Phenol	2.0 g/2L	10.6 mmol/L
		HCl		pH = 4.2
			Column temperature 50 °C	

PCR reagents

Ninhydrin	Ninhydrin	4.0 g/200 mL	0.11 mol/L
	Hydrindantin	0.16 g/200 mL	2.5 mmol/L
	Dimethyl sulfoxide		100 mL
	Lithium acetate buffer (2 mol/L, pH = 5.2 with acetic acid)		100 mL
		Reactor temperature 120 °C	

Care

Regeneration

In the event of temporary loss of column performance:
- Apply fresh eluent, rinse the instrument and column for 1 h at 0.20 mL/min at 65 °C

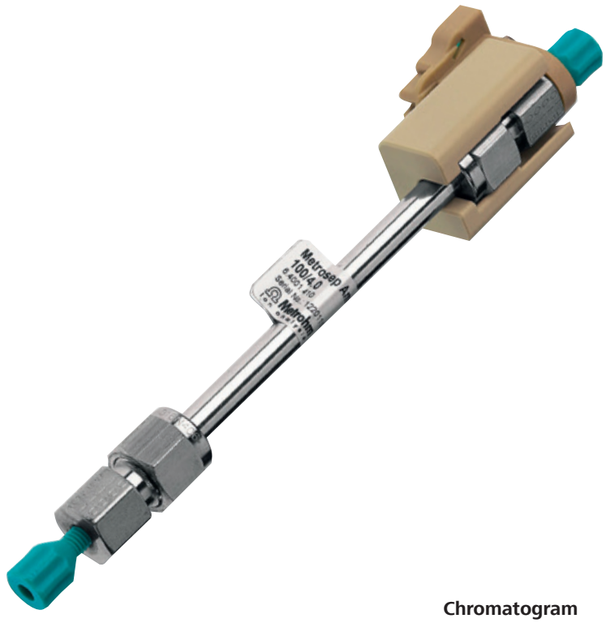
For minor contaminations:
- 120 min 0.3 mol/L lithium hydroxide with 0.25 g/L EDTA (0.20 mL/min, 90 °C)

With contaminations caused by organic components: Rinse the column with the following solutions in sequence (0.2 mL/min, 65 °C):
- 30 min ultrapure water
- 60 min 20% acetonitrile/water
- 60 min ultrapure water to completely remove the acetonitrile

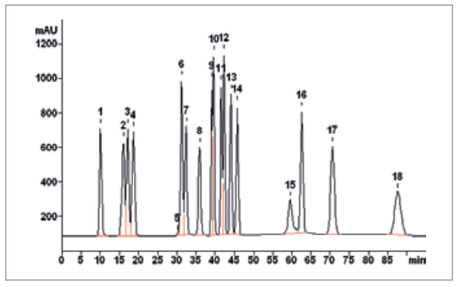
Storage

Short-term: Storage in eluent with 2.5% acetonitrile

Long-term: Storage in 0.3 mol/L lithium hydroxide with 5% acetonitrile.



Chromatogram



Citrate/phenol eluent, standard (λ = 570 nm)

		Conc. (mmol/L)			Conc. (mmol/L)
1	L-aspartic acid	2.5	10	L-methionine	2.5
2	L-serine	2.5	11	L-isoleucine	2.5
3	L-threonine	2.5	12	L-leucine	2.5
4	L-glutamic acid	2.5	13	L-tyrosine	2.5
5	L-proline	2.5	14	L-phenylalanine	2.5
6	Glycine	2.5	15	Ammonium	2.5
7	L-alanine	2.5	16	L-lysine	2.5
8	L-valine	2.5	17	L-histidine	2.5
9	L-cystine	1.25	18	L-arginine	2.5

Ordering information

Metrosep Amino Acids 1 - 100/4.0	6.4001.410
Metrosep RP 2 Guard/3.5	6.1011.030
Metrosep RP 3 Guard HC/4.0	6.1011.040

Separation columns

IC cation-separation columns for analyses without chemical suppression

Nucleosil 5SA - 125/4.0 (6.1007.000)

The Nucleosil 5SA - 125/4.0 cation column uses sulfonic acid groups for separating cations. With eluents containing organic acids and ethylenediamine, this column separates divalent cations such as magnesium and calcium as well as several transition metal elements (e.g. nickel, zinc, cobalt, manganese). The Nucleosil 5SA - 125/4.0 is therefore the inexpensive and robust separation column for the determination of transition metals by direct conductivity measurement without post-column reaction. In addition to high concentrations of alkaline metals, calcium, and magnesium can be determined reliably. The column is only suitable for divalent cations. Monovalent cations elute practically simultaneously with the injection peak.

Applications

- Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, Fe^{2+}, Co^{2+}, Ni^{2+}, Cd^{2+}, Zn^{2+}, Mn^{2+}
- Mg^{2+}, Ca^{2+} in addition to a high amount of sodium

Technical information

Substrate	Spherical silica gel with sulfonic acid groups
Column dimensions	125 x 4.0 mm
Column body	Stainless steel
Standard flow	1.5 mL/min
Maximum flow	5.0 mL/min
Maximum pressure	40 MPa
Particle size	5 µm
pH range	2–8
Temperature range	0–40°C
Capacity	95 µmol (K^+)

Eluents

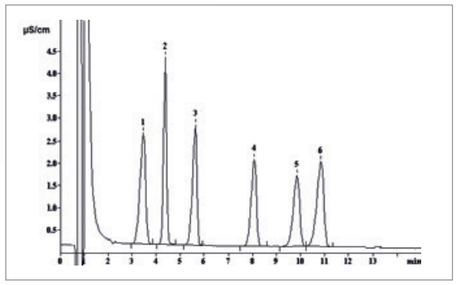
Tartaric acid/ citric acid eluent (standard eluent)	Tartaric acid	1200 mg/2 L	4.0 mmol/L
	Citric acid	192 mg/2 L	0.5 mmol/L
	Ethylenediamine	360 mg/2 L	3.0 mmol/L
	Acetone	100 mL/2 L	5%

Care

Regeneration
Injection of 100 µL Na_2H_2EDTA (0.1 mol/L) – do not use alkaline EDTA solutions – or rinse with 30 mL HNO_3 (0.1 mol/L) at a flow rate of 0.5 mL/min.

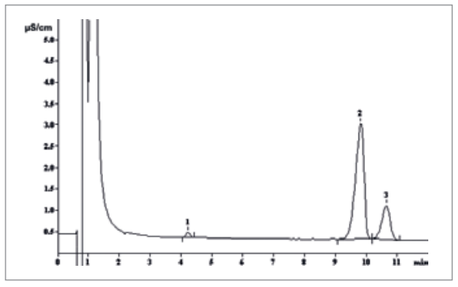
Storage
For short periods (days) in the eluent, for longer periods (weeks) in methanol/water (1:4).

Chromatograms



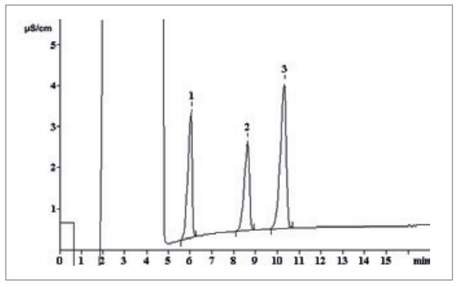
Tartaric acid/citric acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Nickel	5.00	4	Iron (II)	10.00
2	Zinc	5.00	5	Calcium	5.00
3	Cobalt	5.00	6	Magnesium	5.00



Tartaric acid/citric acid eluent, tap water

		Conc. (mg/L)			Conc. (mg/L)
1	Zinc	0.12	3	Magnesium	1.89
2	Calcium	8.94			



Tartaric acid/citric acid eluent, «produced water» of an oil platform

		Conc. (mg/L)			Conc. (mg/L)
1	Strontium	33.8	3	Magnesium	29.0
2	Barium	53.9			

Ordering information

Nucleosil 5SA - 125/4.0	6.1007.000
Nucleosil 5SA 2 Guard cartridge/4.0	6.1007.110
Holder to Nucleosil 5SA 2 Guard Cartridge/4.0 (holder for guard column cartridges 6.1007.110)	6.2821.140

Metrosep C 3 - 100/4.0 (6.1010.410)

The innovative substrate on a polyvinyl alcohol base increases selectivity for monovalent and divalent cations significantly. The peak forms on this cation column are highly symmetrical.

The shortest separation column of the Metrosep-C-3 product range is particularly suitable for rapid separations of standard cations and for the separation of larger organic amines.

Applications

- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+, Mn^{2+}, Co^{2+}, Zn^{2+}, Ni^{2+}
- Larger organic amines
- Low detection limits
- Matrices with high pH

Technical information

Substrate	Polyvinyl alcohol with carboxyl groups
Column dimensions	100 x 4.0 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	1.5 mL/min
Maximum pressure	15 MPa
Particle size	5 µm
Organic modifiers	0–50% acetonitrile, 0–30% acetone, no methanol
pH range	2–12
Temperature range	20–40 °C
Capacity	12 µmol (K^+)

Eluents

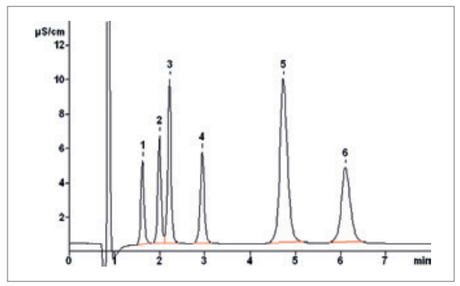
Nitric acid eluent (standard eluent)	Nitric acid (c = 1 mol/L)	10 mL/2 L	5 mmol/L

Care

Regeneration
Add 30% acetonitrile to the standard eluent.

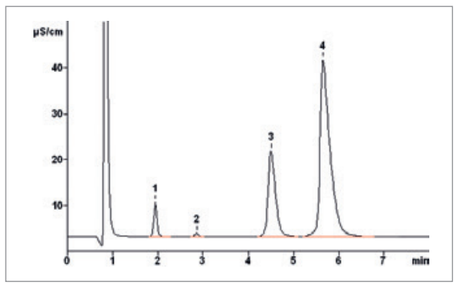
Storage
For 1–3 days in the eluent; in ultrapure water for longer storage.
Recommended temperature: 4–8 °C

Chromatograms



Nitric acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Magnesium	10.00
3	Ammonium	5.00	6	Calcium	10.00



Nitric acid eluent, drinking water

		Conc. (mg/L)			Conc. (mg/L)
1	Sodium	5.83	3	Magnesium	18.91
2	Potassium	1.45	4	Calcium	87.51

Ordering information

Metrosep C 3 - 100/4.0	6.1010.410
Metrosep C 3 Guard/4.0	6.1010.450
Metrosep C 3 S-Guard/4.0	6.1010.460

Metrosep C 3 - 150/4.0 (6.1010.420)

The innovative substrate on a polyvinyl alcohol base increases selectivity for monovalent and divalent cations significantly. The peak forms on this cation column are highly symmetrical.

The middle separation column of the Metrosep-C-3 product range is particularly suitable for rapid separations of standard cations and certain transition metal cations as well as for the separation of mid-sized organic amines.

Applications

- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+, Mn^{2+}, Co^{2+}, Zn^{2+}, Ni^{2+}
- Organic amines
- Low detection limits
- Matrices with high pH

Technical information

Substrate	Polyvinyl alcohol with carboxyl groups
Column dimensions	150 x 4.0 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	1.5 mL/min
Maximum pressure	15 MPa
Particle size	5 µm
Organic modifiers	0–50% acetonitrile, 0–30% acetone, no methanol
pH range	2–12
Temperature range	20–40 °C
Capacity	18 µmol (K^+)

Eluents

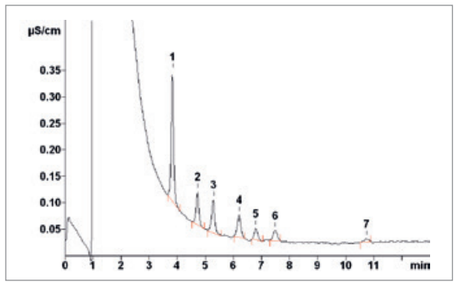
Nitric acid eluent (standard eluent)	Nitric acid (c = 1 mol/L)	10 mL/2 L	5 mmol/L
Nitric acid eluent (modified)	Nitric acid (c = 1 mol/L)	5 mL/2 L	2.5 mmol/L

Care

Regeneration
Add 30% acetonitrile to the standard eluent.

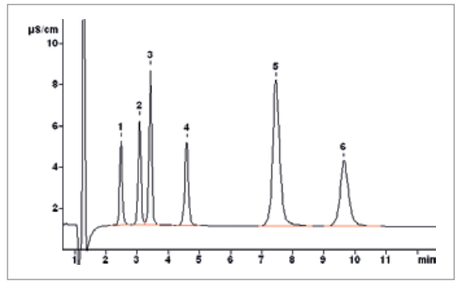
Storage
For 1–3 days in the eluent; in ultrapure water for longer storage.
Recommended temperature: 4–8 °C

Chromatograms



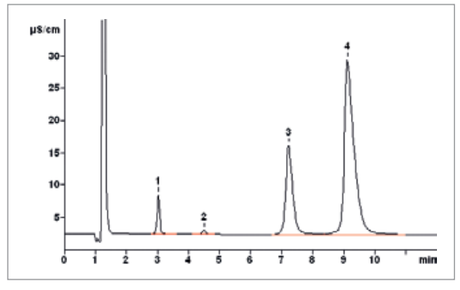
Nitric acid eluent, modified, traces of cations, 40 °C

		Conc. (µg/L)			Conc. (µg/L)
1	Lithium	0.050	5	Potassium	0.050
2	Sodium	0.050	6	Diethylamine	0.100
3	Ammonium	0.050	7	Triethylamine	0.100
4	Monoethylamine	0.100			



Nitric acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Magnesium	10.00
3	Ammonium	5.00	6	Calcium	10.00



Nitric acid eluent, drinking water

		Conc. (mg/L)			Conc. (mg/L)
1	Sodium	5.86	3	Magnesium	18.90
2	Potassium	1.41	4	Calcium	87.48

Ordering information

Metrosep C 3 - 150/4.0	6.1010.420
Metrosep C 3 Guard/4.0	6.1010.450
Metrosep C 3 S-Guard/4.0	6.1010.460

Metrosep C 3 - 250/4.0 (6.1010.430)

The innovative substrate on a polyvinyl alcohol base increases selectivity for monovalent and divalent cations significantly. A characteristic of this is the number of «theoretical plates per meter». On the Metrosep C 3 - 250/4.0, for example, 42,000 plates are achieved for sodium, 51,000 for ammonium, and 31,000 for barium with its delayed elution. The peak forms on this cation column are highly symmetrical.

The selectivity of the Metrosep C 3 - 250/4.0 also permits the separation of transition metals. Because Metrohm ion chromatographs generally determine the cations without chemical suppression, the transition metals can be analyzed on the Metrosep C 3 - 250/4.0 together with the alkaline and earth alkaline metals.

Applications

- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+, Mn^{2+}, Co^{2+}, Zn^{2+}, Ni^{2+}
- Good Na^+/NH_4^+ separation
- Low detection limits
- Matrices with high pH

Technical information

Substrate	Polyvinyl alcohol with carboxyl groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	1.5 mL/min
Maximum pressure	15 MPa
Particle size	5 µm
Organic modifiers	0–50% acetonitrile, 0–30% acetone, no methanol
pH range	2–12
Temperature range	20–40 °C
Capacity	30 µmol (K^+)

Eluents

Nitric acid eluent (standard eluent)	Nitric acid (c = 1 mol/L)	10 mL/2 L	5 mmol/L
Nitric acid/crown ether eluent	Nitric acid (c = 1 mol/L) Crown ether 18-crown-6	7 mL/2 L 264 mg/2 L	3.5 mmol/L 0.5 mmol/L

Care

Regeneration

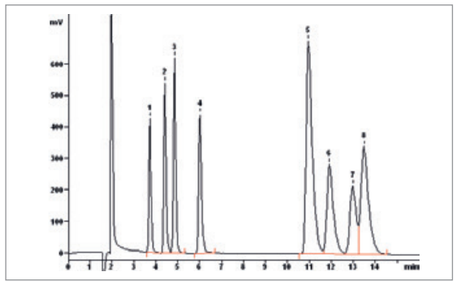
Add 30% acetonitrile to the standard eluent.

Storage

For 1–3 days in the eluent; in ultrapure water for longer storage.

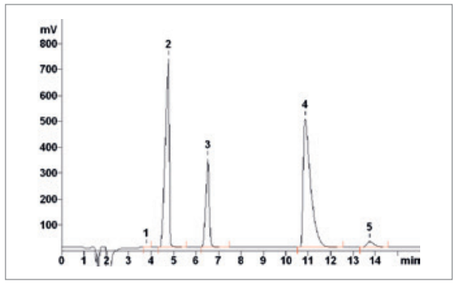
Recommended temperature: 4–8 °C

Chromatograms



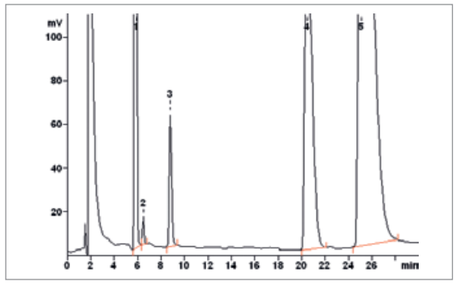
Nitric acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	1.00	5	Magnesium	10.00
2	Sodium	5.00	6	Manganese	10.00
3	Ammonium	5.00	7	Zinc	10.00
4	Potassium	10.00	8	Calcium	10.00



Nitric acid eluent, lake water, 40 °C

		Conc (mg/L)			Conc (mg/L)
1	Lithium	n.q.	4	Magnesium	82.8
2	Sodium	109.7	5	Calcium	6.3
3	Potassium	86.7			



Nitric acid/crown ether eluent, standard

		Conc. (µg/L)			Conc. (µg/L)
1	Sodium	2000	4	Magnesium	2500
2	Ammonium	2	5	Calcium	15000
3	Potassium	500			

Ordering information

Metrosep C 3 - 250/4.0	6.1010.430
Metrosep C 3 Guard/4.0	6.1010.450
Metrosep C 3 S-Guard/4.0	6.1010.460

Metrosep C 4 - 50/4.0 (6.1050.450)

The Metrosep C 4 - 50/4.0 is the shortest separation column in the Metrosep-C-4 product range. With a capacity of 5 µmol (K^+), it is particularly suitable for very rapid separations. The low capacity makes it possible to quickly analyze the earth alkaline metals with their delayed elution. Thanks to the short retention times, applications that, in terms of analysis duration, were previously possible only with an FIA system (Flow Injection Analysis system) can now be transferred over to ion chromatography.

Applications

- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Alkylamines
- Very rapid separations
- Simple sample matrices

Technical information

Substrate	Silica gel with carboxyl groups
Column dimensions	50 x 4.0 mm
Column body	PEEK
Standard flow	0.9 mL/min
Maximum flow	2.0 mL/min
Maximum pressure	25 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohols) Sample: 0–100% acetone, acetonitrile, and alcohols
pH range	2–7
Temperature range	20–60 °C
Capacity	5 µmol (K^+)

Eluents

Nitric acid/ dipicolinic acid eluent (standard eluent)	Nitric acid (c = 1 mol/L) Dipicolinic acid	3.4 mL/2 L 234 mg/2 L	1.7 mmol/L 0.7 mmol/L
Nitric acid eluent (modified)	Nitric acid (c = 1 mol/L)	4 mL/2 L	2.0 mmol/L

Care

Regeneration

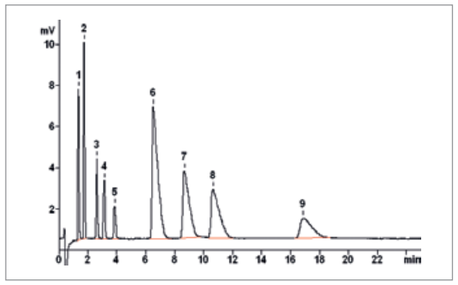
Organic contamination: Rinse the column in the opposite flow direction at a flow rate of 0.9 mL/min for 1 h with ultrapure water, then for 1 h with acetonitrile/water (40/60), and finally for 1 h with ultrapure water.

Inorganic contamination: Rinse the column in the opposite flow direction with 10 mmol/L HNO_3 + 4 mmol/L dipicolinic acid for 1 h at a flow rate of 0.9 mL/min.

Storage

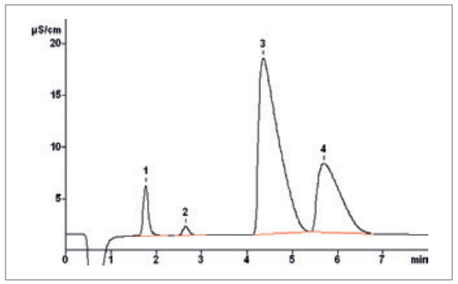
In the eluent or in ultrapure water

Chromatograms



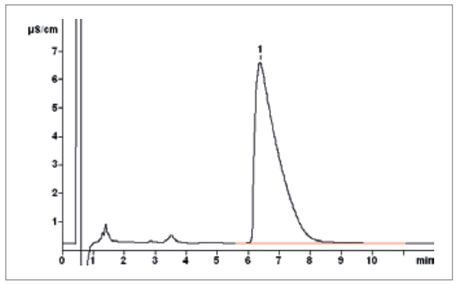
Nitric acid eluent, modified, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	1.00	6	Magnesium	10.00
2	Sodium	5.00	7	Calcium	10.00
3	Potassium	5.00	8	Strontium	20.00
4	Rubidium	10.00	9	Barium	20.00
5	Cesium	10.00			



Nitric acid/dipicolinic acid eluent, drinking water

		Conc. (mg/L)			Conc. (mg/L)
1	Sodium	3.89	3	Calcium	82.82
2	Potassium	1.13	4	Magnesium	18.78



Nitric acid eluent, modified, standard

		Conc. (mg/L)
1	Ethylenediamine	50.0

Ordering information

Metrosep C 4 - 50/4.0	6.1050.450
Metrosep C 4 Guard/4.0	6.1050.500
Metrosep C 4 S-Guard/4.0	6.1050.510

Metrosep C 4 - 100/4.0 (6.1050.410)

The 100 mm version of the Metrosep C 4 column is intended for rapid determinations of the standard cations. Very short retention times are achieved, however the elution times of sodium and ammonium still differ by 25 s. When a special eluent is used, the six cations lithium, ammonium, sodium, calcium, magnesium, and potassium can be determined in less than 5 minutes with the Metrosep C 4 - 100/4.0.

Applications

- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Lipophilic amines with short retention times
- Rapid separations

Technical information

Substrate	Silica gel with carboxyl groups
Column dimensions	100 x 4.0 mm
Column body	PEEK
Standard flow	0.9 mL/min
Maximum flow	2.0 mL/min
Maximum pressure	25 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohols) Sample: 0–100% acetone, acetonitrile, and alcohols
pH range	2–7
Temperature range	20–60 °C
Capacity	10 µmol (K^+)

Eluents

Nitric acid/ dipicolinic acid eluent (standard eluent)	Nitric acid (c = 1 mol/L)	3.4 mL/2 L	1.7 mmol/L
	Dipicolinic acid	234 mg/2 L	0.7 mmol/L
Nitric acid/ dipicolinic acid/acetone eluent	Nitric acid (c = 1 mol/L)	3.4 mL/2 L	1.7 mmol/L
	Dipicolinic acid	234 mg/2 L	0.7 mmol/L
	Acetone	100 mL/2 L	5%
Nitric acid/ dipicolinic acid eluent (modified)	Nitric acid (c = 1 mol/L)	4.0 mL/2 L	2.0 mmol/L
	Dipicolinic acid	401 mg/2 L	1.2 mmol/L

Care

Regeneration

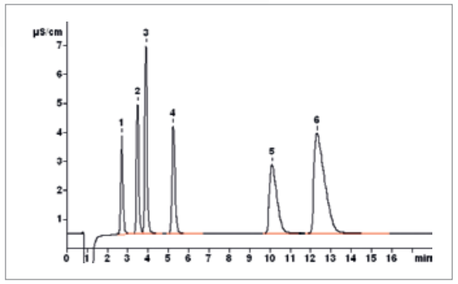
Organic contamination: Rinse the column in the opposite flow direction at a flow rate of 0.9 mL/min for 1 h with ultrapure water, then for 1 h with acetonitrile/water (40/60), and finally for 1 h with ultrapure water.

Inorganic contamination: Rinse the column in the opposite flow direction with 10 mmol/L HNO_3 + 4 mmol/L dipicolinic acid for 1 h at a flow rate of 0.9 mL/min.

Storage

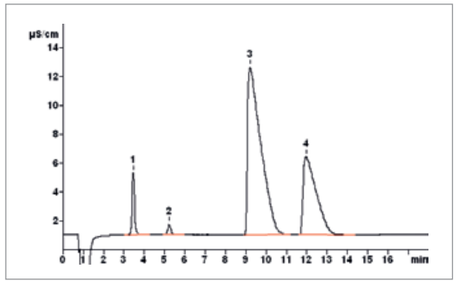
In the eluent or in ultrapure water

Chromatograms



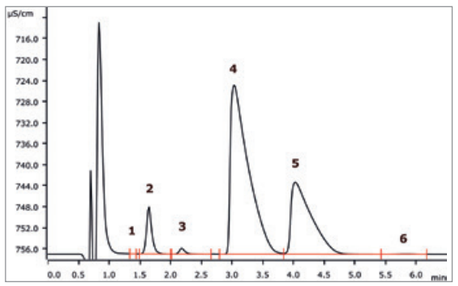
Nitric acid/dipicolinic acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Calcium	10.00
3	Ammonium	5.00	6	Magnesium	10.00



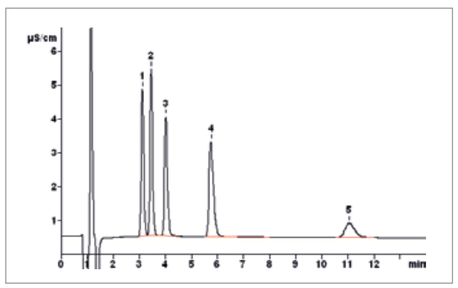
Nitric acid/dipicolinic acid eluent, drinking water

		Conc. (mg/L)			Conc. (mg/L)
1	Sodium	3.89	3	Calcium	82.82
2	Potassium	1.13	4	Magnesium	18.78



Nitric acid/dipicolinic acid eluent, drinking water

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	n.q.	4	Calcium	87.4
2	Sodium	20.6	5	Magnesium	19.9
3	Potassium	1.7	6	Strontium	n.q.



Nitric acid/dipicolinic acid/acetone eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Sodium	5.00	4	Guanidine	15.00
2	Ammonium	5.00	5	Aminoguanidine	15.00
3	Methylamine	5.00			

Ordering information

Metrosep C 4 - 100/4.0	6.1050.410
Metrosep C 4 Guard/4.0	6.1050.500
Metrosep C 4 S-Guard/4.0	6.1050.510
Metrosep C 4 S-Guard - 50/4.0	6.1050.530

Metrosep C 4 - 150/4.0 (6.1050.420)

The Metrosep C 4 - 150/4.0 is the universal standard column in cation analysis for accomplishing high separating efficiency in a short time. The Metrosep C 4 - 150/4.0 is the ideal separation column for the analysis of alkaline and earth alkaline metals in aqueous media.

Applications

- Standard column
- Amines
- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Universal applications
- Different matrices

Technical information

Substrate	Silica gel with carboxyl groups
Column dimensions	150 x 4.0 mm
Column body	PEEK
Standard flow	0.9 mL/min
Maximum flow	2.0 mL/min
Maximum pressure	25 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohols) Sample: 0–100% acetone, acetonitrile, and alcohols
pH range	2–7
Temperature range	20–60 °C
Capacity	15 µmol (K^+)

Eluents

Nitric acid/ dipicolinic acid eluent (standard eluent)	Nitric acid (c = 1 mol/L) Dipicolinic acid	3.4 mL/2 L 234 mg/2 L	1.7 mmol/L 0.7 mmol/L
Nitric acid/ dipicolinic acid/ crown ether eluent	Nitric acid (c = 1 mol/L) Dipicolinic acid 18-crown-6	3.4 mL/2 L 234 mg/2 L 26.4 mg/2 L	1.7 mmol/L 0.7 mmol/L 0.05 mmol/L

Care

Regeneration

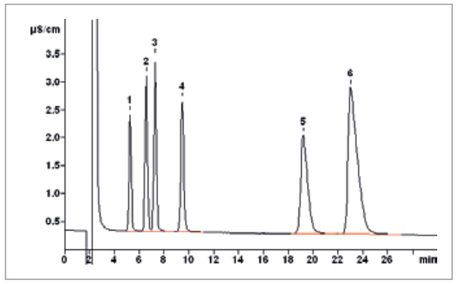
Organic contamination: Rinse the column in the opposite flow direction at a flow rate of 0.9 mL/min for 1 h with ultrapure water, then for 1 h with acetonitrile/water (40/60), and finally for 1 h with ultrapure water.

Inorganic contamination: Rinse the column in the opposite flow direction with 10 mmol/L HNO_3 + 4 mmol/L dipicolinic acid for 1 h at a flow rate of 0.9 mL/min.

Storage

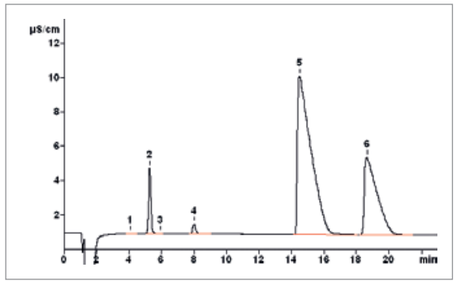
In the eluent or in ultrapure water

Chromatograms



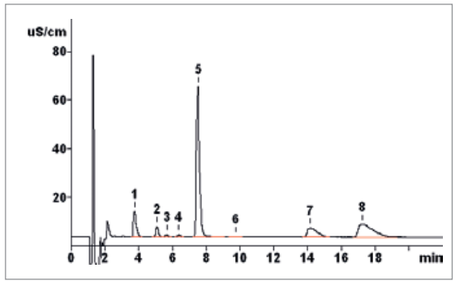
Nitric acid/dipicolinic acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Calcium	10.00
3	Ammonium	5.00	6	Magnesium	10.00



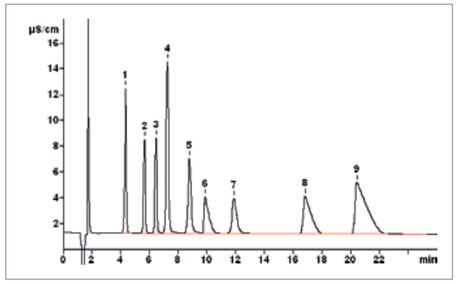
Nitric acid/dipicolinic acid eluent, drinking water

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	n.q.	4	Potassium	1.13
2	Sodium	3.89	5	Calcium	82.82
3	Ammonium	n.q.	6	Magnesium	18.78



Nitric acid/dipicolinic acid eluent, wine

		Conc. (mg/L)			Conc. (mg/L)
1	unknown	–	5	Potassium	1100
2	unknown	–	6	Histamine	110.8
3	unknown	–	7	unknown	–
4	unknown	–	8	Magnesium	n.q.



Nitric acid/dipicolinic acid/crown ether eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	2.00	6	Potassium	10.0
2	Sodium	5.00	7	Triethanolamine	30.0
3	Ammonium	5.00	8	Calcium	10.0
4	Monoethanolamine	30.0	9	Magnesium	10.0
5	Diethanolamine	30.0			

Ordering information

Metrosep C 4 - 150/4.0	6.1050.420
Metrosep C 4 Guard/4.0	6.1050.500
Metrosep C 4 S-Guard/4.0	6.1050.510
Metrosep C 4 S-Guard - 50/4.0	6.1050.530

Metrosep C 4 - 250/4.0 (6.1050.430)

The Metrosep C 4 - 250/4.0 is the cation column with the greatest capacity in the C 4 series. It is predestined for applications which require the highest separating efficiency. Samples with extreme differences in concentrations can be analyzed reliably with this column. The performance capability of the column is demonstrated, for example, when analyzing boiler feed water for which the requirement is the perfect quantification of 7 µg/L sodium in addition to 7 mg/L monoethanolamine (MEA). With the Metrosep C 4 - 250/4.0, not only amines and transition metals but also alkaline and alkaline earth metals can be determined in a single run.

Applications

- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+, Co^{2+}, Ni^{2+}, Zn^{2+}, Cd^{2+}, Pb^{2+}, amines
- Very good Na^+/NH_4^+ separation
- NH_4^+, $(CH_3)NH_3^+$, $(CH_3)_2NH_2^+$, $(CH_3)_3NH^+$, $(CH_3)_4N^+$, and the respective ethanolamines
- Difficult separation problems
- Great differences in concentration
- Transition metals

Technical information

Substrate	Silica gel with carboxyl groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	0.9 mL/min
Maximum flow	2.0 mL/min
Maximum pressure	25 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohols) Sample: 0–100% acetone, acetonitrile, and alcohols
pH range	2–7
Temperature range	20–60 °C
Capacity	25 µmol (K^+)

Eluents

Nitric acid/ dipicolinic acid eluent (standard eluent)	Nitric acid (c = 1 mol/L)	3.4 mL/2 L	1.7 mmol/L
	Dipicolinic acid	234 mg/2 L	0.7 mmol/L
Amine eluent	Nitric acid (c = 1 mol/L)	3.4 mL/2 L	1.7 mmol/L
	Dipicolinic acid	234 mg/2 L	0.7 mmol/L
	18-crown-6	26.4 mg/2 L	0.05 mmol/L
	Acetone	25 mL/2 L	2.5%

Care

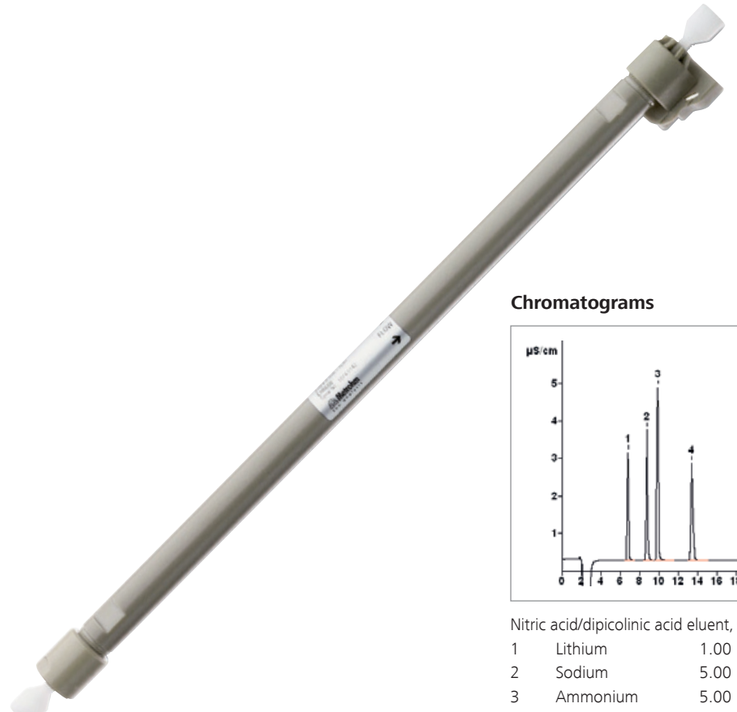
Regeneration

Organic contamination: Rinse the column in the opposite flow direction at a flow rate of 0.9 mL/min for 1 h with ultrapure water, then for 1 h with acetonitrile/water (40/60), and finally for 1 h with ultrapure water.

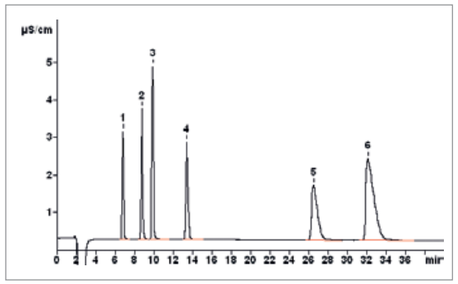
Inorganic contamination: Rinse the column in the opposite flow direction with 10 mmol/L HNO_3 + 4 mmol/L dipicolinic acid for 1 h at a flow rate of 0.9 mL/min.

Storage

In the eluent or in ultrapure water

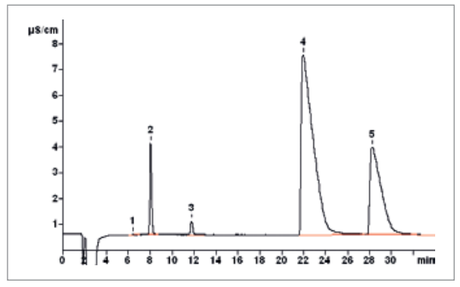


Chromatograms



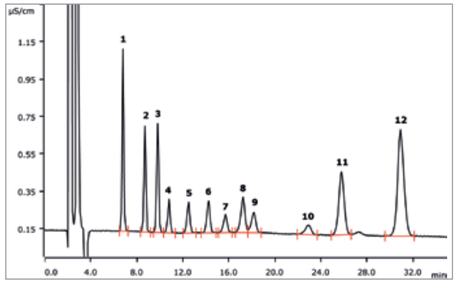
Nitric acid/dipicolinic acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Calcium	10.00
3	Ammonium	5.00	6	Magnesium	10.00



Nitric acid/dipicolinic acid eluent, drinking water

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	n.q.	4	Calcium	82.81
2	Sodium	3.90	5	Magnesium	18.76
3	Potassium	1.12			



Amine eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	0.4	8	Methyldiethanol-amine	4.0
2	Sodium	1.0			
3	Ammonium	1.0	9	Diethanolisopro-panolamine	4.0
4	Ethanolamine	1.0			
5	Diethanolamine	2.0	10	Triisopropanolamine	4.0
6	Potassium	1.0	11	Calcium	2.0
7	Triethanolamine	2.0	12	Magnesium	2.0

Ordering information

Metrosep C 4 - 250/4.0	6.1050.430
Metrosep C 4 Guard/4.0	6.1050.500
Metrosep C 4 S-Guard/4.0	6.1050.510
Metrosep C 4 S-Guard - 50/4.0	6.1050.530

Metrosep C 6 - 100/4.0 (6.1051.410)

The 100 mm version of the Metrosep C 6 column is designed to determine standard cations, e.g., in drinking water. Excellent separation of sodium and ammonium is still achieved, despite the very short retention times. The high capacity of the Metrosep C 6 material permits larger sample volumes.

Applications

- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Lipophilic amines with short retention times
- Rapid separations

Technical information

Substrate	Silica gel with carboxyl groups
Column dimensions	100 x 4.0 mm
Column body	PEEK
Standard flow	0.9 mL/min
Maximum flow	3.5 mL/min
Maximum pressure	20 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohols) Sample: 0–100% acetone, acetonitrile, and alcohols
pH range	2–7
Temperature range	20–60 °C
Standard temperature	20–30 °C
Capacity	20 µmol (K^+)

Eluents

Nitric acid/ dipicolinic acid eluent (standard eluent)	Nitric acid (c = 1 mol/L)	3.4 mL/2 L	1.7 mmol/L
	Dipicolinic acid	568 mg/2 L	1.7 mmol/L
Oxalic acid/ dipicolinic acid/ acetonitril eluent	Oxalic acid	360 mg/2 L	2.0 mmol/L
	Dipicolinic acid	668 mg/2 L	2.0 mmol/L
	Acetonitril	40 mL/2 L	2%

Care

Regeneration

The column must be rinsed with ultrapure water before and after the regeneration.

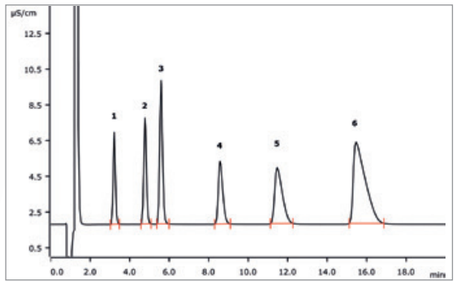
Organic contamination: Rinse the column in the opposite flow direction at a flow rate of 0.9 mL/min for 1 h with ultrapure water, then for 1 h with acetonitrile/water (40/60).

Inorganic contamination: Rinse the column in the opposite flow direction with 10 mmol/L HNO_3 + 4 mmol/L dipicolinic acid for 1 h at a flow rate of 0.9 mL/min.

Storage

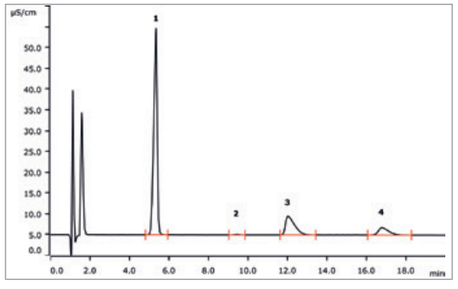
Standard eluent at 10–22 °C

Chromatograms



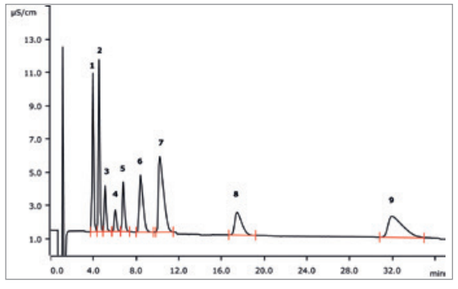
Nitric acid/dipicolinic acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Calcium	10.00
3	Ammonium	5.00	6	Magnesium	10.00



Nitric acid/dipicolinic acid eluent, drinking water

		Conc. (mg/L)			Conc. (mg/L)
1	Sodium	112.12	3	Calcium	33.44
2	Potassium	0.75	4	Magnesium	6.88



Oxalic acid/dipicolinic acid/acetonitril eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Sodium	20	6	Calcium	20
2	Ammonium	20	7	Magnesium	20
3	Monoethanolamine	20	8	Strontium	20
4	Potassium	20	9	Barium	40
5	Diethanolamine	20			

Ordering information

Metrosep C 6 - 100/4.0	6.1051.410
Metrosep C 6 Guard/4.0	6.1051.500
Metrosep C 6 S-Guard/4.0	6.1051.510

Metrosep C 6 - 150/4.0 (6.1051.420)

The high-capacity Metrosep C 6 material makes the Metrosep C 6 - 150/4.0 separation column the optimum solution for the separation of standard cations with high differences in concentration in conjunction with reasonable retention times. Drinking water with low ammonium contents can be determined with this column.

Applications

- Standard column
- Amines
- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Universal applications
- Different matrices
- Transition metals

Technical information

Substrate	Silica gel with carboxyl groups
Column dimensions	150 x 4.0 mm
Column body	PEEK
Standard flow	0.9 mL/min
Maximum flow	2.5 mL/min
Maximum pressure	20 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohols) Sample: 0–100% acetone, acetonitrile, and alcohols
pH range	2–7
Temperature range	20–60 °C
Standard temperature	20–30 °C
Capacity	30 µmol (K^+)

Eluents

Nitric acid/ dipicolinic acid eluent (standard eluent)	Nitric acid (c = 1 mol/L) Dipicolinic acid	3.4 mL/2 L 568 mg/2 L	1.7 mmol/L 1.7 mmol/L

Care

Regeneration

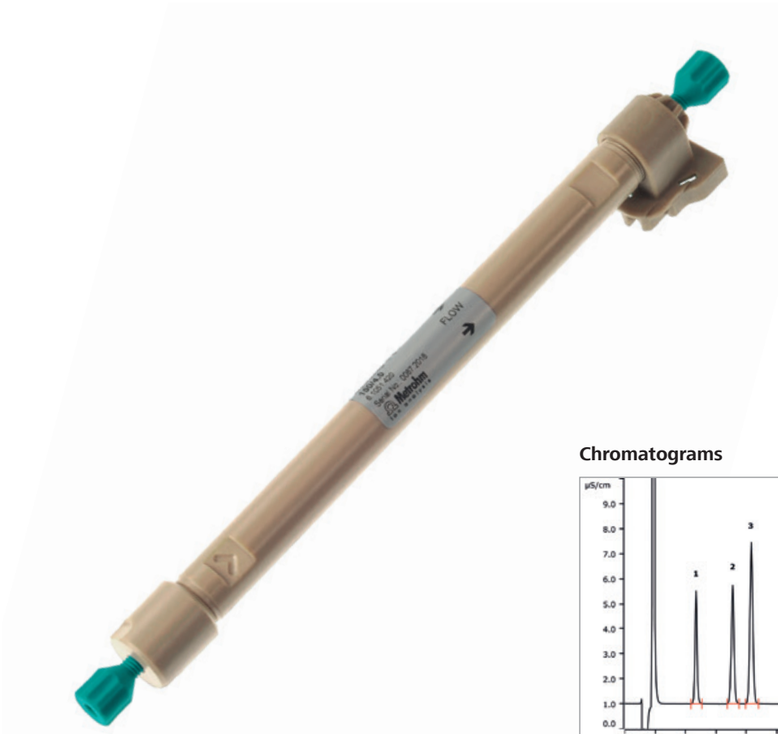
The column must be rinsed with ultrapure water before and after the regeneration.

Organic contamination: Rinse the column in the opposite flow direction at a flow rate of 0.9 mL/min for 1 h with ultrapure water, then for 1 h with acetonitrile/water (40/60).

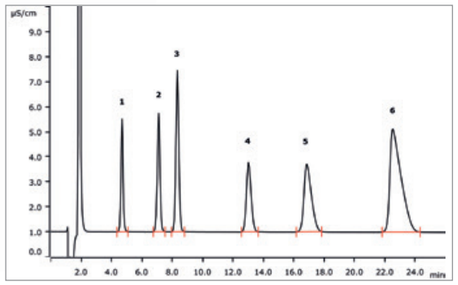
Inorganic contamination: Rinse the column in the opposite flow direction with 10 mmol/L HNO_3 + 4 mmol/L dipicolinic acid for 1 h at a flow rate of 0.9 mL/min.

Storage

Standard eluent at 10–22 °C

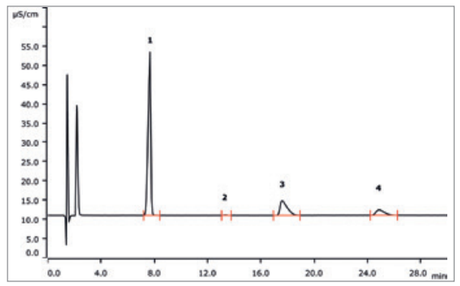


Chromatograms



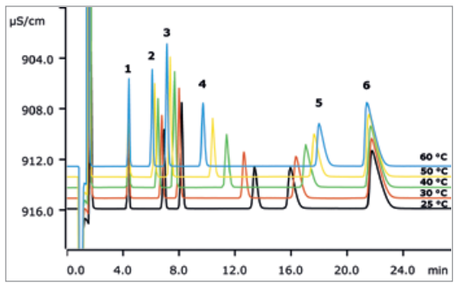
Nitric acid/dipicolinic acid eluent, standard — Conc. (mg/L)

1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Calcium	10.00
3	Ammonium	5.00	6	Magnesium	10.00



Nitric acid/dipicolinic acid eluent, drinking water — Conc. (mg/L)

1	Sodium	109.78	3	Calcium	34.03
2	Potassium	0.65	4	Magnesium	6.59



Nitric acid/dipicolinic acid eluent — Conc. (mg/L)
Temperature dependency

1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Calcium	10.00
3	Ammonium	5.00	6	Magnesium	10.00

Ordering information

Metrosep C 6 - 150/4.0	6.1051.420
Metrosep C 6 Guard/4.0	6.1051.500
Metrosep C 6 S-Guard/4.0	6.1051.510

Metrosep C 6 - 250/4.0 (6.1051.430)

The Metrosep C 6 - 250/4.0 is the cation column with the greatest capacity in the Metrosep C 6 series. It is predestined for applications which require the highest separating efficiency. Samples with extreme differences in concentrations can be analyzed reliably with this column. The separation of sodium and ammonium is particularly outstanding here.

Applications

- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+, Co^{2+}, Ni^{2+}, Zn^{2+}, Cd^{2+}, Pb^{2+}, amines
- Excellent Na^+/NH_4^+ separation
- NH_4^+, $(CH_3)NH_3^+$, $(CH_3)_2NH_2^+$, $(CH_3)_3NH^+$, $(CH_3)_4N^+$, and the respective ethanolamines
- Difficult separation problems
- Great differences in concentration
- Transition metals

Technical information

Substrate	Silica gel with carboxyl groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	0.9 mL/min
Maximum flow	1.5 mL/min
Maximum pressure	20 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohols) Sample: 0–100% acetone, acetonitrile, and alcohols
pH range	2–7
Temperature range	20–60 °C
Standard temperature	20–30 °C
Capacity	50 µmol (K^+)

Eluents

Nitric acid/ dipicolinic acid eluent (standard eluent)	Nitric acid (c = 1 mol/L) Dipicolinic acid	3.4 mL/2 L 568 mg/2 L	1.7 mmol/L 1.7 mmol/L
Nitric acid/ dipicolinic acid eluent (modified)	Nitric acid (c = 1 mol/L) Dipicolinic acid	16 mL/2 L 434 mg/2 L	8.0 mmol/L 1.3 mmol/L

Care

Regeneration

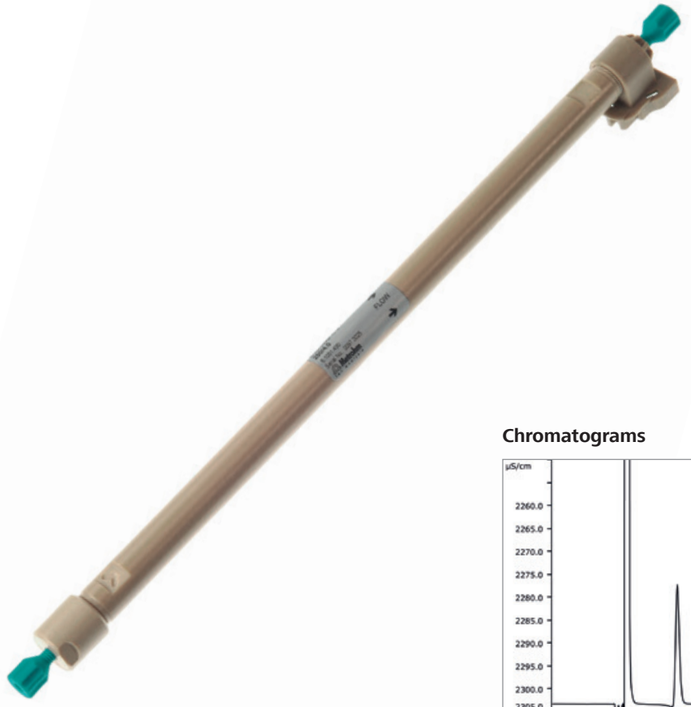
The column must be rinsed with ultrapure water before and after the regeneration.

Organic contamination: Rinse the column in the opposite flow direction at a flow rate of 0.9 mL/min for 1 h with ultrapure water, then for 1 h with acetonitrile/water (40/60).

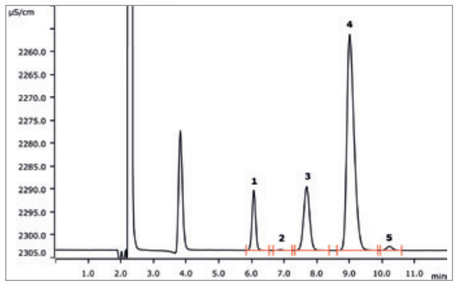
Inorganic contamination: Rinse the column in the opposite flow direction with 10 mmol/L HNO_3 + 4 mmol/L dipicolinic acid for 1 h at a flow rate of 0.9 mL/min.

Storage

Standard eluent at 10–22 °C

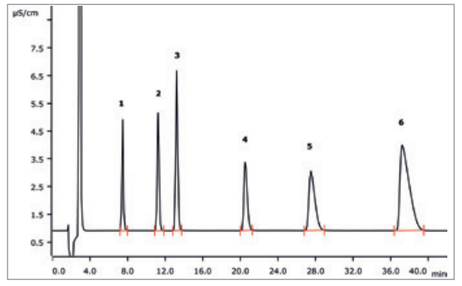


Chromatograms



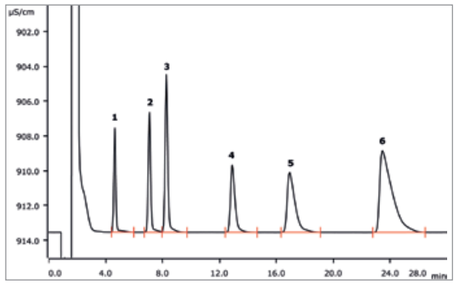
Nitric acid/dipicolinic acid eluent (modified), water

		Conc. (mg/L)			Conc. (mg/L)
1	Sodium	3.06	4	Calcium	25.7
2	Ammonium	0.03	5	Potassium	0.67
3	Magnesium	2.95			



Nitric acid/dipicolinic acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Calcium	10.00
3	Ammonium	5.00	6	Magnesium	10.00

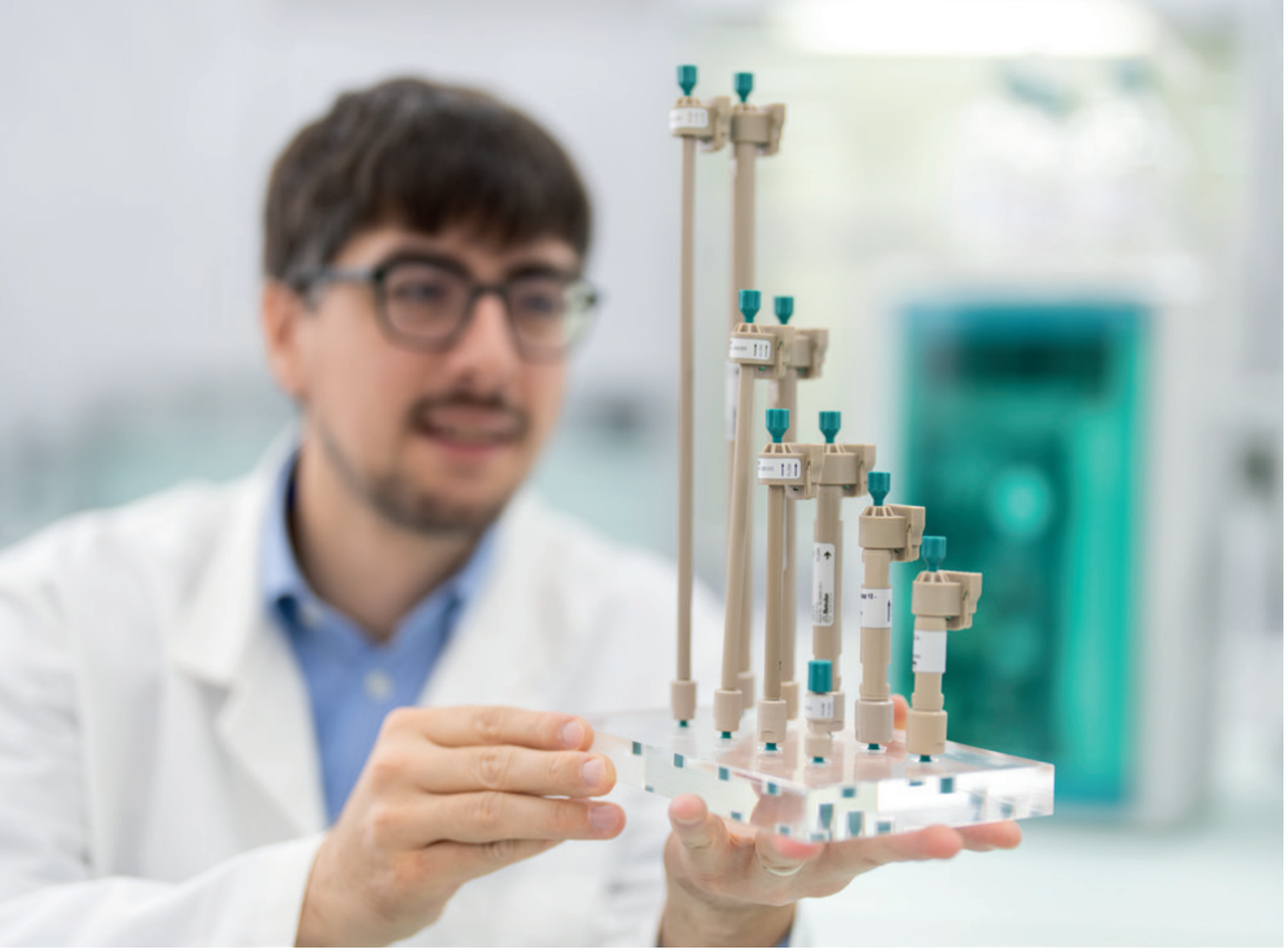


Nitric acid/dipicolinic acid eluent, methanol

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Calcium	10.00
3	Ammonium	5.00	6	Magnesium	10.00

Ordering information

Metrosep C 6 - 250/4.0	6.1051.430
Metrosep C 6 Guard/4.0	6.1051.500
Metrosep C 6 S-Guard/4.0	6.1051.510



Separation columns

Microbore IC cation-separation columns for lower eluent consumption and greater sensitivity

Metrosep C 4 - 100/2.0 (6.1050.210)

The short version of the Metrosep C 4 column with 2 mm inner diameter is intended for rapid determinations of the standard cations. Very short retention times are achieved, however the elution times of sodium and ammonium still differ by 25 s. When a special eluent is used, the six cations lithium, ammonium, sodium, calcium, magnesium, and potassium can be determined in less than 5 minutes with the Metrosep C 4 - 100/2.0. With its low eluent flow, this column is particularly suitable for IC-MS coupling.

Applications

- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Lipophilic amines with short retention times
- High flow rate - fast separations
- Fast analysis

Technical information

Substrate	Silica gel with carboxyl groups
Column dimensions	100 x 2.0 mm
Column body	PEEK
Standard flow	0.2 mL/min
Maximum flow	1.6 mL/min
Maximum pressure	25 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohols) Sample: 0–100% acetone, acetonitrile, and alcohols
pH range	2–7
Temperature range	20–60 °C
Capacity	3 µmol (K^+)

Eluents

Nitric acid/ dipicolinic acid eluent (standard eluent)	Nitric acid (c = 1 mol/L)	3.4 mL/2 L	1.7 mmol/L
	Dipicolinic acid	234 mg/2 L	0.7 mmol/L
Nitric acid/ dipicolinic acid eluent (modified)	Nitric acid (c = 1 mol/L)	4.0 mL/2 L	2.0 mmol/L
	Dipicolinic acid	401 mg/2 L	1.2 mmol/L

Care

Regeneration

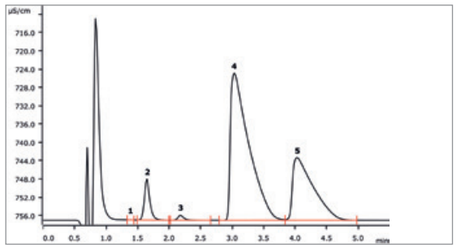
Organic contamination: Rinse the column in the opposite flow direction at a flow rate of 0.2 mL/min for 1 h with ultrapure water, then for 1 h with acetonitrile/water (40/60), and finally for 1 h with ultrapure water.

Inorganic contamination: Rinse the column in the opposite flow direction with 10 mmol/L HNO_3 + 4 mmol/L dipicolinic acid for 1 h at a flow rate of 0.2 mL/min.

Storage

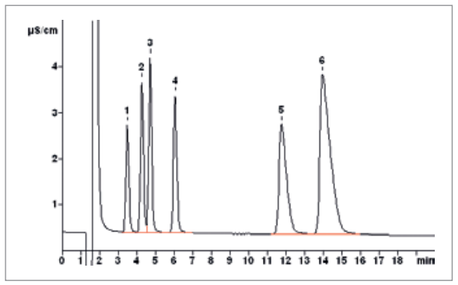
In the eluent or in ultrapure water

Chromatograms



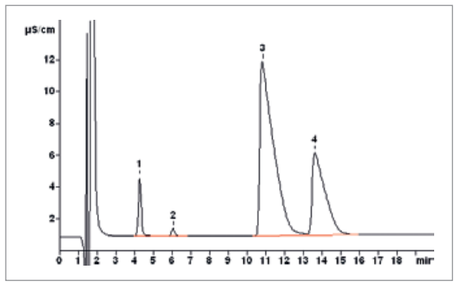
Nitric acid/dipicolinic acid eluent (modified), drinking water

1	Lithium	n.q.	4	Calcium	87.42
2	Sodium	6.03	5	Magnesium	19.94
3	Potassium	1.69			



Nitric acid/dipicolinic acid eluent, standard

1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Calcium	10.00
3	Ammonium	5.00	6	Magnesium	10.00



Nitric acid/dipicolinic acid eluent, drinking water

1	Sodium	3.89	3	Calcium	82.82
2	Potassium	1.13	4	Magnesium	18.78

Ordering information

Metrosep C 4 - 100/2.0	6.1050.210
Metrosep C 4 Guard/2.0	6.1050.600
Metrosep C 4 S-Guard/2.0	6.1050.610

Metrosep C 4 - 150/2.0 (6.1050.220)

The Metrosep C 4 - 150/2.0 is the universal standard column in cation analysis using microbore separation columns. It can achieve a high separating efficiency in a brief determination time. The Metrosep C 4 - 150/2.0 is the ideal separation column for the analysis of alkaline and earth alkaline metals in aqueous media. With its low eluent flow, this column is particularly suitable for IC-MS coupling.

Applications

- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Amines
- Transition metals

Technical information

Substrate	Silica gel with carboxyl groups
Column dimensions	150 x 2.0 mm
Column body	PEEK
Standard flow	0.2 mL/min
Maximum flow	1.1 mL/min
Maximum pressure	25 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohols) Sample: 0–100% acetone, acetonitrile, and alcohols
pH range	2–7
Temperature range	20–60 °C
Capacity	4 µmol (K^+)

Eluents

Nitric acid/ dipicolinic acid eluent (standard eluent)	Nitric acid (c = 1 mol/L) Dipicolinic acid	3.4 mL/2 L 234 mg/2 L	1.7 mmol/L 0.7 mmol/L
Nitric acid/ dipicolinic acid eluent (modified)	Nitric acid (c = 1 mol/L) Dipicolinic acid	4.0 mL/2 L 43.6 mg/2 L	2.0 mmol/L 0.13 mmol/L
Nitric acid eluent	Nitric acid (c = 1 mol/L)	4.0 mL/2 L	2.0 mmol/L

Care

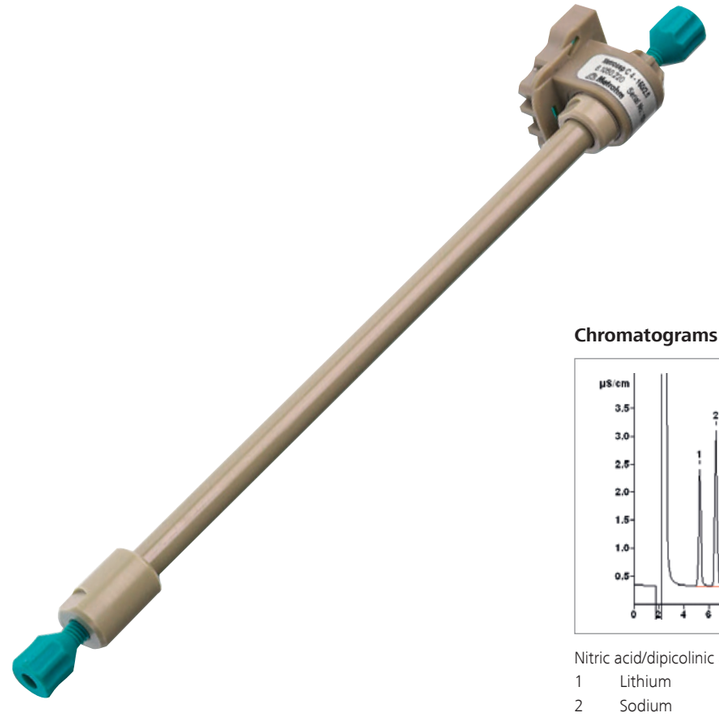
Regeneration

Organic contamination: Rinse the column in the opposite flow direction at a flow rate of 0.2 mL/min for 1 h with ultrapure water, then for 1 h with acetonitrile/water (40/60), and finally for 1 h with ultrapure water.

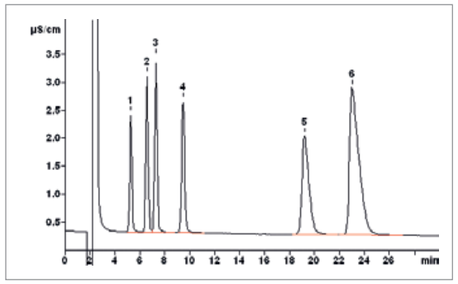
Inorganic contamination: Rinse the column in the opposite flow direction with 10 mmol/L HNO_3 + 4 mmol/L dipicolinic acid for 1 h at a flow rate of 0.2 mL/min.

Storage

In the eluent or in ultrapure water

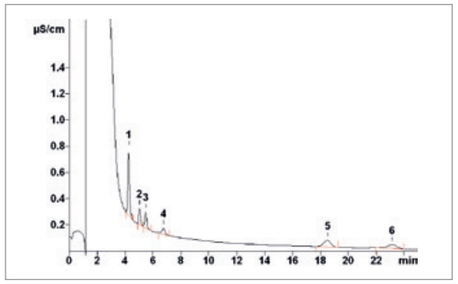


Chromatograms



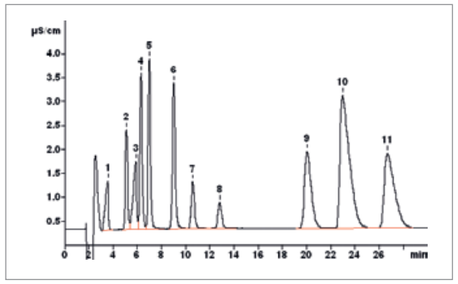
Nitric acid/dipicolinic acid eluent, standard — Conc. (mg/L)

1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Calcium	10.00
3	Ammonium	5.00	6	Magnesium	10.00



Nitric acid eluent, traces of cations (MiPCT), 40 °C — Conc. (µg/L)

1	Lithium	0.50	4	Potassium	0.50
2	Sodium	0.50	5	Magnesium	0.50
3	Ammonium	0.50	6	Calcium	0.50



Nitric acid/dipicolinic acid eluent (mod.), standard — Conc. (mg/L)

1	Zinc	2.50	7	Lead	2.50
2	Lithium	0.25	8	Cesium	2.50
3	Cobalt	2.50	9	Manganese	2.50
4	Sodium	1.25	10	Magnesium	2.50
5	Ammonium	1.25	11	Calcium	2.50
6	Potassium	2.50			

Ordering information

Metrosep C 4 - 150/2.0	6.1050.220
Metrosep C 4 Guard/2.0	6.1050.600
Metrosep C 4 S-Guard/2.0	6.1050.610

Metrosep C 4 - 250/2.0 (6.1050.230)

The Metrosep C 4 - 250/2.0 is the cation column with the greatest capacity in the Metrosep C 4 microbore series. It is predestined for applications which require the highest separating efficiency. Samples with high differences in concentrations can be analyzed reliably with this column. The performance capability of the column is demonstrated, for example, when analyzing of sodium traces in addition to monoethanolamine (MEA). With the Metrosep C 4 - 250/2.0, not only amines and transition metals but also alkaline and alkaline earth metals can be determined in a single run. With its low eluent flow, this column is particularly suitable for IC-MS coupling.

Applications

- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+, Co^{2+}, Ni^{2+}, Zn^{2+}, Cd^{2+}, Pb^{2+}, amines
- Good Na^+/NH_4^+ separation
- NH_4^+, $(CH_3)NH_3^+$, $(CH_3)_2NH_2^+$, $(CH_3)_3NH^+$, $(CH_3)_4N^+$, and the respective ethanolamines
- Difficult separation problems
- High differences in concentration
- Transition metals

Technical information

Substrate	Silica gel with carboxyl groups
Column dimensions	250 x 2.0 mm
Column body	PEEK
Standard flow	0.2 mL/min
Maximum flow	0.8 mL/min
Maximum pressure	25 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohols) Sample: 0–100% acetone, acetonitrile, and alcohols
pH range	2–7
Temperature range	20–60 °C
Capacity	6 µmol (K^+)

Eluents

Nitric acid/ dipicolinic acid eluent (standard eluent)	Nitric acid (c = 1 mol/L)	3.4 mL/2 L	1.7 mmol/L
	Dipicolinic acid	234 mg/2 L	0.7 mmol/L
Nitric acid/ oxalic acid eluent	Nitric acid (c = 1 mol/L)	5.0 mL/2 L	2.5 mmol/L
	Oxalic acid	90 mg/2 L	0.5 mmol/L

Care

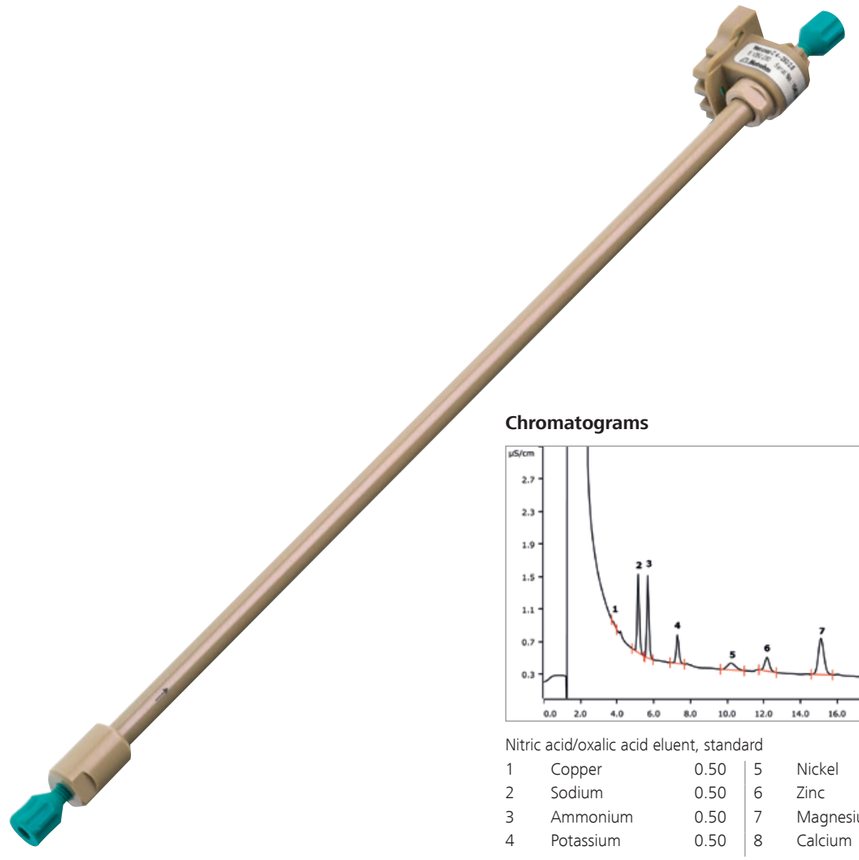
Regeneration

Organic contamination: Rinse the column in the opposite flow direction at a flow rate of 0.2 mL/min for 1 h with ultrapure water, then for 1 h with acetonitrile/water (40/60), and finally for 1 h with ultrapure water.

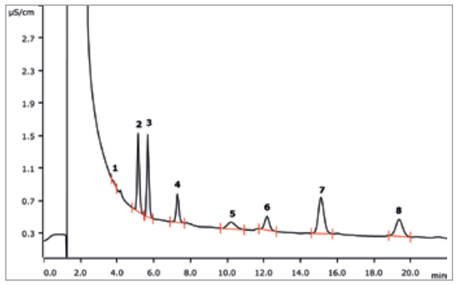
Inorganic contamination: Rinse the column in the opposite flow direction with 10 mmol/L HNO_3 + 4 mmol/L dipicolinic acid for 1 h at a flow rate of 0.2 mL/min.

Storage

In the eluent or in ultrapure water

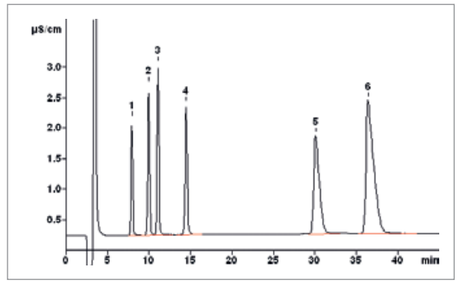


Chromatograms



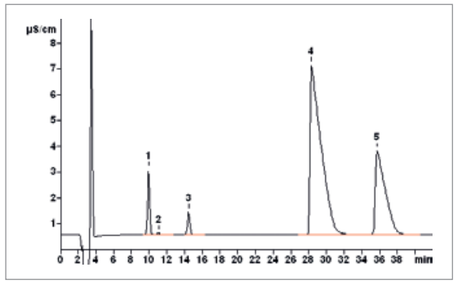
Nitric acid/oxalic acid eluent, standard

		Conc. (µg/L)			Conc. (µg/L)
1	Copper	0.50	5	Nickel	0.50
2	Sodium	0.50	6	Zinc	0.50
3	Ammonium	0.50	7	Magnesium	0.50
4	Potassium	0.50	8	Calcium	0.50



Nitric acid/dipicolinic acid eluent, standard

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Calcium	10.00
3	Ammonium	5.00	6	Magnesium	10.00



Nitric acid/dipicolinic acid eluent, drinking water

		Conc. (mg/L)			Conc. (mg/L)
1	Sodium	3.90	4	Calcium	82.81
2	Ammonium	n.q.	5	Magnesium	18.76
3	Potassium	1.12			

Ordering information

Metrosep C 4 - 250/2.0	6.1050.230
Metrosep C 4 Guard/2.0	6.1050.600
Metrosep C 4 S-Guard/2.0	6.1050.610

Metrosep C 6 - 100/2.0 (6.01051.210)

The 100 mm version of the microbore Metrosep C 6 column is intended for the determination of standard cations, for example in drinking water. Short retention times are attained with a relatively good sodium/ammonium separation. The high capacity of the Metrosep C 6 material permits larger sample volumes.

The column is suitable for use in IC-MS coupling.

Applications

- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Lipophilic amines with short retention times
- Rapid separations
- IC-MS coupling

Technical information

Substrate	Silica gel with carboxyl groups
Column dimensions	100 x 2.0 mm
Column body	PEEK
Standard flow	0.25 mL/min
Maximum flow	1.0 mL/min
Maximum pressure	20 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohols) Sample: 0–100% acetone, acetonitrile, and alcohols
pH range	2–7
Temperature range	20–60 °C
Standard temperature	20–30 °C
Capacity	5 µmol (K^+)

Eluent

Nitric acid/ dipicolinic acid eluent (standard eluent)	Nitric acid (c = 1 mol/L)	3.4 mL/2 L	1.7 mmol/L
	Dipicolinic acid	568 mg/2 L	1.7 mmol/L

Care

Regeneration

The column must be rinsed with ultrapure water before and after the regeneration.

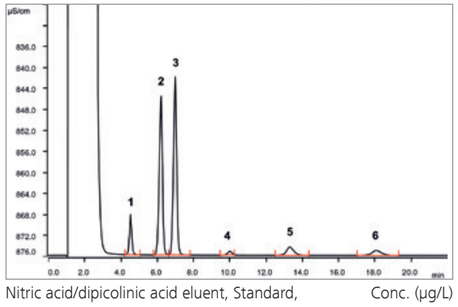
Organic contamination: Rinse the column in the opposite flow direction at a flow rate of 0.25 mL/min for 1 h with ultrapure water, then for 1 h with acetonitrile/water (40/60), and finally for 1 h with ultrapure water.

Inorganic contamination: Rinse the column in the opposite flow direction with 10 mmol/L HNO_3 + 4 mmol/L dipicolinic acid for 1 h at a flow rate of 0.25 mL/min.

Storage

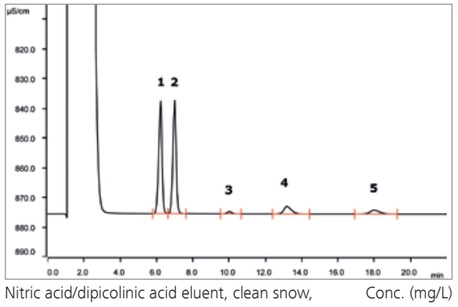
Standard eluent at 10–22 °C

Chromatograms



Nitric acid/dipicolinic acid eluent, Standard, 250 µL, 30 °C

		Conc. (µg/L)			Conc. (µg/L)
1	Lithium	40	4	Potassium	40
2	Sodium	800	5	Calcium	120
3	Ammonium	800	6	Magnesium	40



Nitric acid/dipicolinic acid eluent, clean snow, 250 µL, 30 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Sodium	1.044	4	Calcium	0.200
2	Ammonium	0.905	5	Magnesium	0.058
3	Potassium	0.052			

Ordering information

Metrosep C 6 - 100/2.0	6.01051.210
Metrosep C 6 Guard/2.0	6.01051.600

Metrosep C 6 - 150/2.0 (6.01051.220)

The high-capacity Metrosep C 6 material makes the microbore Metrosep C 6 - 150/2.0 column the optimum solution for separating of standard cations with high differences in concentration with reasonable retention times. Drinking water with low ammonium contents can be determined with this column.
The column is suitable for use in IC-MS coupling.

Applications

- Standard column
- Amines
- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Universal applications
- Different matrices
- Transition metals
- IC-MS coupling

Technical information

Substrate	Silica gel with carboxyl groups
Column dimensions	150 x 2.0 mm
Column body	PEEK
Standard flow	0.25 mL/min
Maximum flow	0.7 mL/min
Maximum pressure	20 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohols) Sample: 0–100% acetone, acetonitrile, and alcohols
pH range	2–7
Temperature range	20–60 °C
Standard temperature	20–30 °C
Capacity	8 µmol (K^+)

Eluents

Nitric acid/ dipicolinic acid eluent (standard eluent)	Nitric acid (c = 1 mol/L) Dipicolinic acid	3.4 mL/2 L 568 mg/2 L	1.7 mmol/L 1.7 mmol/L

Care

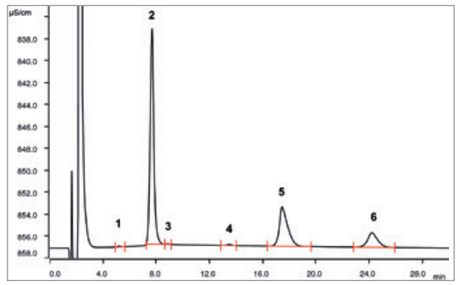
Regeneration
The column must be rinsed with ultrapure water before and after the regeneration.

Organic contamination: Rinse the column in the opposite flow direction at a flow rate of 0.25 mL/min for 1 h with ultrapure water, then for 1 h with acetonitrile/water (40/60), and finally for 1 h with ultrapure water.

Inorganic contamination: Rinse the column in the opposite flow direction with 10 mmol/L HNO_3 + 4 mmol/L dipicolinic acid for 1 h at a flow rate of 0.25 mL/min.

Storage
Standard eluent at 10–22 °C

Chromatograms



Nitric acid/dipicolinic acid eluent, standard, 30 °C, 5 µL

1	Lithium	0.02	3	Potassium	0.21
2	Sodium	20.75	4	Calcium	10.42
3	Ammonium	0.02	6	Magnesium	2.08

Conc. (mg/L)

Ordering information

Metrosep C 6 - 150/2.0	6.01051.220
Metrosep C 6 Guard/2.0	6.01051.600

Metrosep C 6 - 250/2.0 (6.01051.230)

The Metrosep C 6 - 250/2.0 is the microbore cation column with the greatest capacity in the Metrosep C 6 series. It is predestined for applications which require the highest separating efficiency. Samples with extreme differences in concentrations can be analyzed reliably with this column. The separation of sodium and ammonium is particularly outstanding here. The column is suitable for use in IC-MS coupling.

Applications

- Li^+, Na^+, K^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+, Co^{2+}, Ni^{2+}, Zn^{2+}, Cd^{2+}, Pb^{2+}, amines
- Excellent Na^+/NH_4^+ separation
- NH_4^+, $(CH_3)NH_3^+$, $(CH_3)_2NH_2^+$, $(CH_3)_3NH^+$, $(CH_3)_4N^+$, and the respective ethanolamines
- Difficult separation problems
- Great differences in concentration
- IC-MS coupling

Technical information

Substrate	Silica gel with carboxyl groups
Column dimensions	250 x 2.0 mm
Column body	PEEK
Standard flow	0.25 mL/min
Maximum flow	0.4 mL/min
Maximum pressure	20 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohols) Sample: 0–100% acetone, acetonitrile, and alcohols
pH range	2–7
Temperature range	20–60 °C
Standard temperature	20–30 °C
Capacity	13 µmol (K^+)

Eluents

Nitric acid/ dipicolinic acid eluent (standard eluent)	Nitric acid (c = 1 mol/L) Dipicolinic acid	3.4 mL/2 L 568 mg/2 L	1.7 mmol/L 1.7 mmol/L
Nitric acid eluent	Nitric acid (c = 1 mol/L)	13.5 mL/2 L	6.75 mmol/L

Care

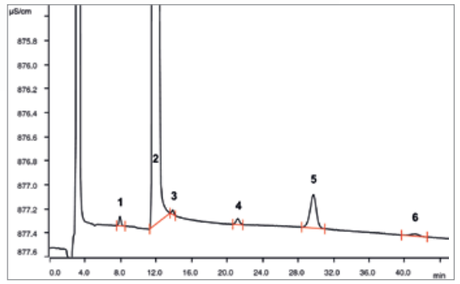
Regeneration
The column must be rinsed with ultrapure water before and after the regeneration.

Organic contamination: Rinse the column in the opposite flow direction at a flow rate of 0.25 mL/min for 1 h with ultrapure water, then for 1 h with acetonitrile/water (40/60), and finally for 1 h with ultrapure water.

Inorganic contamination: Rinse the column in the opposite flow direction with 10 mmol/L HNO_3 + 4 mmol/L dipicolinic acid for 1 h at a flow rate of 0.25 mL/min.

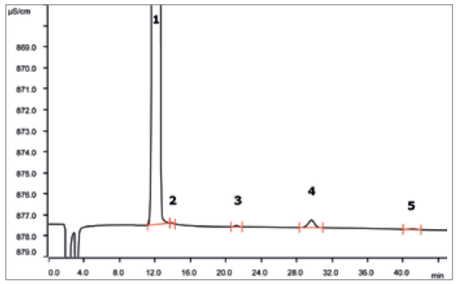
Storage
Standard eluent at 10–22 °C

Chromatograms



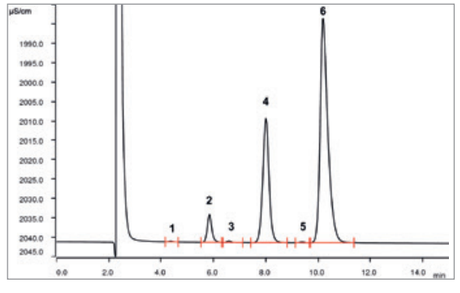
Nitric acid/dipicolinic acid eluent, standard, 5 µL, 30 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	0.02	4	Potassium	0.16
2	Sodium	80.00	5	Calcium	1.00
3	Ammonium	0.02	6	Magnesium	0.04



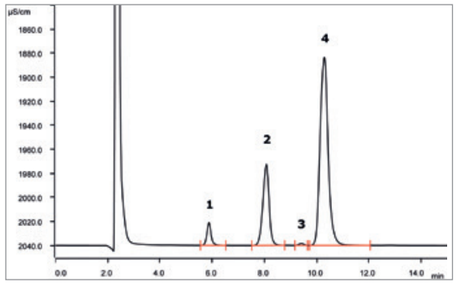
Nitric acid/dipicolinic acid eluent, roadside snow, 5 µL, 30 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Sodium	5029	4	Calcium	32.9
2	Ammonium	n.q.	5	Magnesium	1.8
3	Potassium	5.5			



Nitric acid eluent, standard, 0.9 mL/min, 30 °C, 5 µL

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	0.02	4	Magnesium	10.14
2	Sodium	3.06	5	Potassium	0.38
3	Ammonium	0.02	6	Calcium	41.02



Nitric acid eluent, mod., drinking water, 0.9 mL/min, 30 °C, 10 µL

		Conc. (mg/L)			Conc. (mg/L)
1	Sodium	7.52	3	Potassium	2.80
2	Magnesium	21.40	4	Calcium	109.58

Ordering information

Metrosep C 6 - 250/2.0	6.01051.230
Metrosep C 6 Guard/2.0	6.01051.600

Separation columns

IC cation-separation columns for analyses with chemical suppression

Metrosep C Supp 1 - 100/4.0 (6.1052.410)

The short version of the Metrosep C Supp 1 is used for the rapid determination of cations in the µg/L range with conductivity detection following sequential suppression.

The baseline noise in cation analysis is improved by the suppression. This results in lower detection limits for the cations to be determined.

Applications

- Li^+, Na^+, K^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Samples with low concentrations
- Larger amines
- Low limits of detection
- Fast analysis
- Excellent peak shape
- Matrix with high pH

Technical information

Substrate	Polyvinyl alcohol with carboxyl groups
Column dimensions	100 x 4.0 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	1.5 mL/min
Maximum pressure	15 MPa
Particle size	5 µm
Organic modifier	0–50% acetonitrile, 0–30% acetone, no methanol
pH range	1–12
Temperature range	20–40 °C
Standard temperature	40 °C
Capacity	12 µmol (K^+)

Eluents

Nitric acid eluent	Nitric acid (c = 1 mol/L)	10 mL/2 L	5.0 mmol/L
(standard eluent)	Rubidium	172.5 µg/2 L ($RbNO_3$)	50 µg/L Rb^+

Care

Note:
Ensure that the maximum pressure is never exceeded during regeneration. If the pressure becomes too high, reduce the flow rate.

Regeneration:
1. Disconnect the column outlet from the downstream function units such as suppressor or detector and collect the flow of liquid in a beaker instead.
2. Rinse the column with ultrapure water before and after regeneration.

Depending on the type of contamination, proceed in accordance with one of the following instructions:

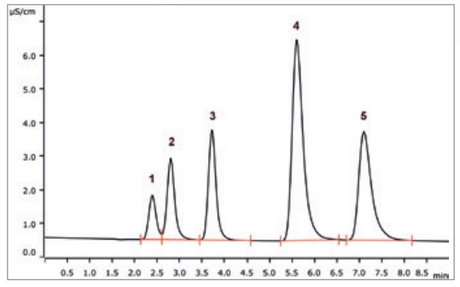
Organic contaminations:
Regenerate the column in the direction opposite to the flow at a flow rate of 1.0 mL/min with the following solutions in succession:

1. 1 h with ultrapure water
2. 1 h with acetonitrile-water mixture (30:70)
3. 1 h with ultrapure water

Inorganic contaminations:
1. Add 30% acetonitrile to the standard eluent.
2. Regenerate the column in the direction opposite to the flow at a flow rate of 1.0 mL/min for 1 h.

Storage
Store the column in ultrapure water at 4–8 °C.
Do not store the column below 0 °C.

Chromatogram



Nitric acid eluent, standard, 40 °C

					Conc. (mg/L)
1	Lithium	1.00	4	Magnesium	10.00
2	Sodium	5.00	5	Calcium	10.00
3	Potassium	10.00			

Ordering information

Metrosep C Supp 1 - 100/4.0	6.1052.410
Metrosep C Supp 1 Guard/4.0	6.1052.500

Metrosep C Supp 1 - 150/4.0 (6.1052.420)

The Metrosep C Supp 1 - 150/4.0 separation column is the column of choice for the determination of low concentrations of standard cations.

Detection limits below one µg/L are achieved through low baseline noise after sequential suppression.

Applications

- Li^+, Na^+, K^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Samples with low concentrations
- Organic amines
- Low limits of detection
- Transition metals
- Fast analysis
- Excellent peak shape
- Matrix with high pH

Technical information

Substrate	Polyvinyl alcohol with carboxyl groups
Column dimensions	150 x 4.0 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	1.5 mL/min
Maximum pressure	15 MPa
Particle size	5 µm
Organic modifier	0–50% acetonitrile, 0–30% acetone, no methanol
pH range	1–12
Temperature range	20–40 °C
Standard temperature	40 °C
Capacity	18 µmol (K^+)

Eluents

Nitric acid eluent	Nitric acid (c = 1 mol/L)	10 mL/2 L	5.0 mmol/L
(standard eluent)	Rubidium	172.5 µg/2 L ($RbNO_3$)	50 µg/L Rb^+

Care

Note:
Ensure that the maximum pressure is never exceeded during regeneration. If the pressure becomes too high, reduce the flow rate.

Regeneration:
1. Disconnect the column outlet from the downstream function units such as suppressor or detector and collect the flow of liquid in a beaker instead.
2. Rinse the column with ultrapure water before and after regeneration.

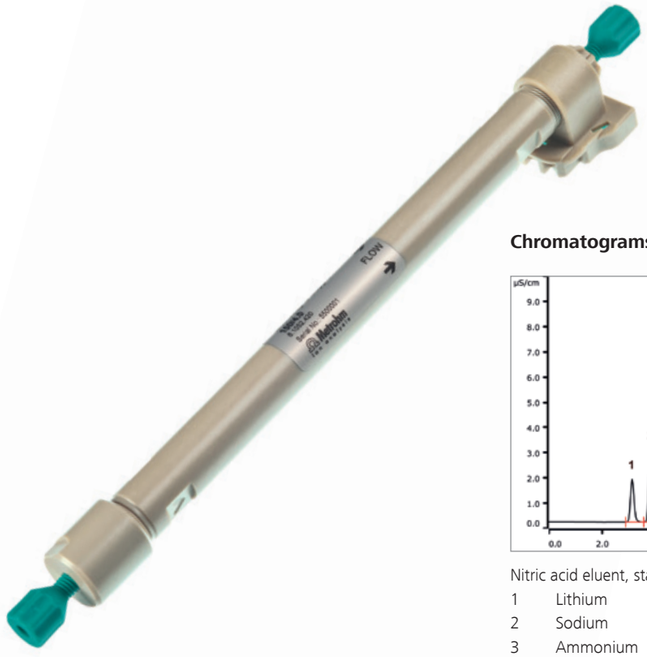
Depending on the type of contamination, proceed in accordance with one of the following instructions:

Organic contaminations:
Regenerate the column in the direction opposite to the flow at a flow rate of 1.0 mL/min with the following solutions in succession:

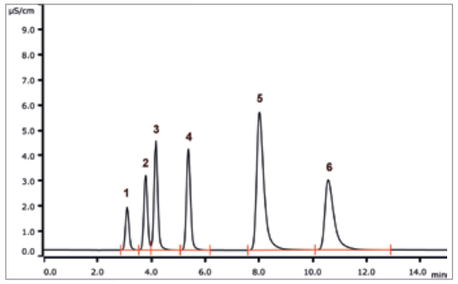
1. 1 h with ultrapure water
2. 1 h with acetonitrile-water mixture (30:70)
3. 1 h with ultrapure water

Inorganic contaminations:
1. Add 30% acetonitrile to the standard eluent.
2. Regenerate the column in the direction opposite to the flow at a flow rate of 1.0 mL/min for 1 h.

Storage
Store the column in ultrapure water at 4–8 °C.
Do not store the column below 0 °C

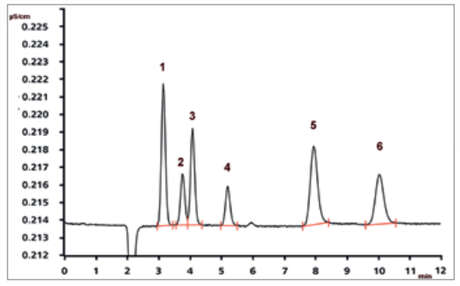


Chromatograms



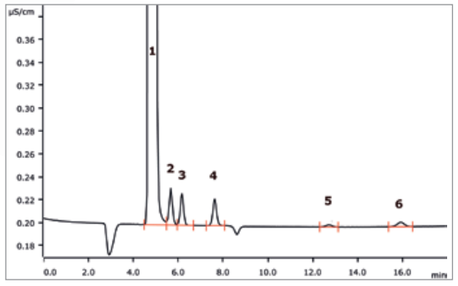
Nitric acid eluent, standard, 40 °C — Conc. (mg/L)

1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Magnesium	10.00
3	Ammonium	5.00	6	Calcium	10.00



Nitric acid eluent, trace standard, 40 °C — Conc. (µg/L)

1	Lithium	10.0	4	Potassium	10.0
2	Sodium	10.0	5	Magnesium	10.0
3	Ammonium	10.0	6	Calcium	10.0



Nitric acid eluent, lithium hexafluoride, 40 °C — Conc. (µg/L)

1	Lithium	499	4	Potassium	3.9
2	Sodium	3.4	5	Magnesium	0.3
3	Ammonium	2.9	6	Calcium	1.5

Ordering information

Metrosep C Supp 1 - 150/4.0	6.1052.420
Metrosep C Supp 1 Guard/4.0	6.1052.500

Metrosep C Supp 1 - 250/4.0 (6.1052.430)

The Metrosep C Supp 1 - 250/4.0 separation column is used for difficult separations of standard cations, some transition cations and amines in the low concentration range. Conductivity detection after sequential suppression enables low detection limits thanks to low baseline noise.

Applications

- Li^+, Na^+, K^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Samples with low concentrations
- Good Na^+/NH_4^+ separation
- Low limits of detection
- Matrix with high pH

Technical information

Substrate	Polyvinyl alcohol with carboxyl groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	1.5 mL/min
Maximum pressure	15 MPa
Particle size	5 µm
Organic modifier	0–50% acetonitrile, 0–30% acetone, no methanol
pH range	1–12
Temperature range	20–40 °C
Standard temperature	40 °C
Capacity	30 µmol (K^+)

Eluents

Nitric acid eluent (standard eluent)	Nitric acid (c = 1 mol/L)	10 mL/2 L	5.0 mmol/L
	Rubidium	172.5 µg/2 L ($RbNO_3$)	50 µg/L Rb^+

Care

Note:
Ensure that the maximum pressure is never exceeded during regeneration. If the pressure becomes too high, reduce the flow rate.

Regeneration:
1. Disconnect the column outlet from the downstream function units such as suppressor or detector and collect the flow of liquid in a beaker instead.
2. Rinse the column with ultrapure water before and after regeneration.

Depending on the type of contamination, proceed in accordance with one of the following instructions:

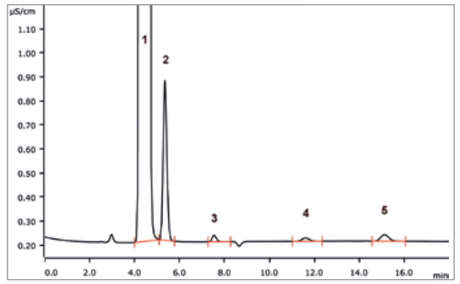
Organic contaminations:
Regenerate the column in the direction opposite to the flow at a flow rate of 1.0 mL/min with the following solutions in succession:

1. 1 h with ultrapure water
2. 1 h with acetonitrile-water mixture (30:70)
3. 1 h with ultrapure water

Inorganic contaminations:
1. Add 30% acetonitrile to the standard eluent.
2. Regenerate the column in the direction opposite to the flow at a flow rate of 1.0 mL/min for 1 h.

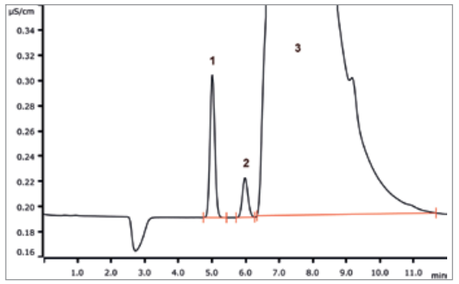
Storage
Store the column in ultrapure water at 4–8 °C.
Do not store the column below 0 °C

Chromatograms



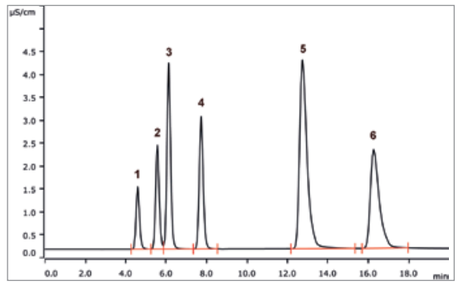
Nitric acid eluent, geological leachate, 40 °C — Conc. (mg/L)

1	Lithium	164.6	4	Magnesium	0.35
2	Sodium	12.9	5	Calcium	1.02
3	Potassium	0.81			



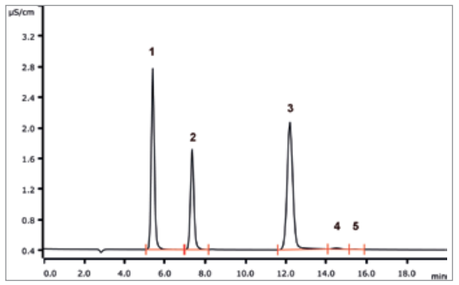
Nitric acid eluent, power plant sample, MiPCT-ME, 2000 µL, 40 °C — Conc. (µg/L)

1	Lithium	1.0	3	Monoethanolamine (MEA)	4000
2	Sodium	1.0			



Nitric acid eluent, standard, 40 °C — Conc. (mg/L)

1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Magnesium	10.00
3	Ammonium	5.00	6	Calcium	10.00



Nitric acid eluent, magnesium sport drink, 40 °C — Conc. (mg/L)

1	Sodium	227	4	Zinc	6.0
2	Potassium	202	5	Calcium	0.6
3	Magnesium	165			

Ordering information

Metrosep C Supp 1 - 250/4.0	6.1052.430
Metrosep C Supp 1 Guard/4.0	6.1052.500

Metrosep C Supp 2 - 100/4.0 (6.01053.410)

The Metrosep C Supp 2 separation material is based on a poly(styrene-co-divinylbenzene) copolymer with carboxyl groups. It is suitable for the separation and determination of monovalent and divalent cations. The Metrosep C Supp 2 - 100/4.0 column is the shortest separation column in the Metrosep C Supp 2 product range. It is especially suitable for trace analysis of standard cations. Limits of quantification below the µg/L range are achieved thanks to the extremely low baseline noise following sequential suppression.

Applications

- Li^+, Na^+, K^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Samples with low concentrations
- Larger amines
- Low limits of detection
- Fast analysis
- Excellent peak shape
- Matrix with high pH

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with carboxyl groups
Column dimensions	100 x 4.0 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	3.8 mL/min
Maximum pressure	25 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohol) Sample: 0–100% acetone, acetonitrile and alcohols
pH range	Eluent: 0–12 Sample: 0–14
Temperature range	10–60 °C
Standard temperature	40 °C
Capacity	23 µmol (K^+)

Eluents

Nitric acid eluent (standard eluent)	Nitric acid (c = 1 mol/L) Rubidium	10 mL/2 L 172.5 µg/2 L ($RbNO_3$)	5.0 mmol/L 50 µg/L Rb^+
Nitric acid eluent (modified)	Nitric acid (c = 1 mol/L) Rubidium	14 mL/2 L 172.5 µg/2 L ($RbNO_3$)	7.0 mmol/L 50 µg/L Rb^+

Care

Note:
Ensure that the maximum pressure is never exceeded during regeneration. If the pressure becomes too high, reduce the flow rate.

Preparation:
Rinse the column with eluent for 3 h.

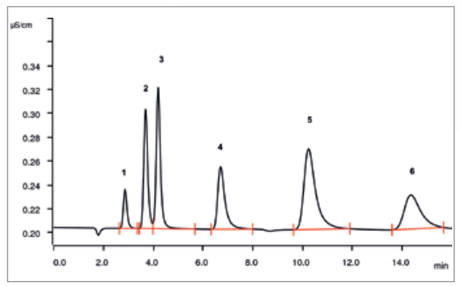
Regeneration:
1. Disconnect the column outlet from the downstream function units such as suppressor or detector and collect the flow of liquid in a beaker instead.
2. Depending on the type of contamination, proceed in accordance with one of the following instructions:

a. Organic contaminations:
Regenerate the column in the direction opposite to the flow at a flow rate of 1.0 mL/min with the following solutions in succession:
1. 1 h with ultrapure water
2. 1 h with acetonitrile-water mixture (40:60)
3. 1 h with ultrapure water

b. Inorganic contaminations:
Regenerate the column in the direction opposite to the flow at a flow rate of 1.0 mL/min for 1 h with 50 mmol/L nitric acid.

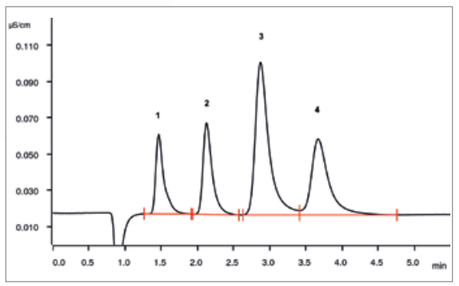
Storage
Store the column in standard eluent at ambient temperature.

Chromatogram



Nitric acid eluent, standard, 40 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	1.00	4	Magnesium	10.00
2	Sodium	5.00	5	Calcium	10.00
3	Potassium	10.00			



Nitric acid eluent, modified, 60 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	0.125	3	Magnesium	0.250
2	Sodium	0.250	4	Calcium	0.250

Ordering information

Metrosep C Supp 2 - 100/4.0	6.01053.410
Metrosep C Supp 2 Guard/4.0	6.01053.500

Metrosep C Supp 2 - 150/4.0 (6.01053.420)

The Metrosep C Supp 2 - 150/4.0 column is the standard separation column of the Metrosep C Supp 2 product range. It is suitable for the separation and determination of monovalent and divalent cations with an excellent sodium/ammonium separation. The Metrosep C Supp 2 separation material is based on a poly(styrene-co-divinylbenzene) copolymer with carboxyl groups. The column is used with sequential suppression, therefore it is particularly suitable for determining concentrations in the middle µg/L range and below.

Applications

- Li^+, Na^+, K^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Samples with low concentrations
- Organic amines
- Low limits of detection
- Transition metals
- Fast analysis
- Excellent peak shape
- Matrix with high pH

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with carboxyl groups
Column dimensions	150 x 4.0 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	3.1 mL/min
Maximum pressure	25 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohol) Sample: 0–100% acetone, acetonitrile and alcohols
pH range	Eluent: 0–12 Sample: 0–14
Temperature range	10–60 °C
Standard temperature	40 °C
Capacity	35 µmol (K^+)

Eluents

Nitric acid eluent (standard eluent)	Nitric acid (c = 1 mol/L)	10 mL/2 L	5.0 mmol/L
	Rubidium	172.5 µg/2 L ($RbNO_3$)	50 µg/L Rb^+

Care

Note:
Ensure that the maximum pressure is never exceeded during regeneration. If the pressure becomes too high, reduce the flow rate.

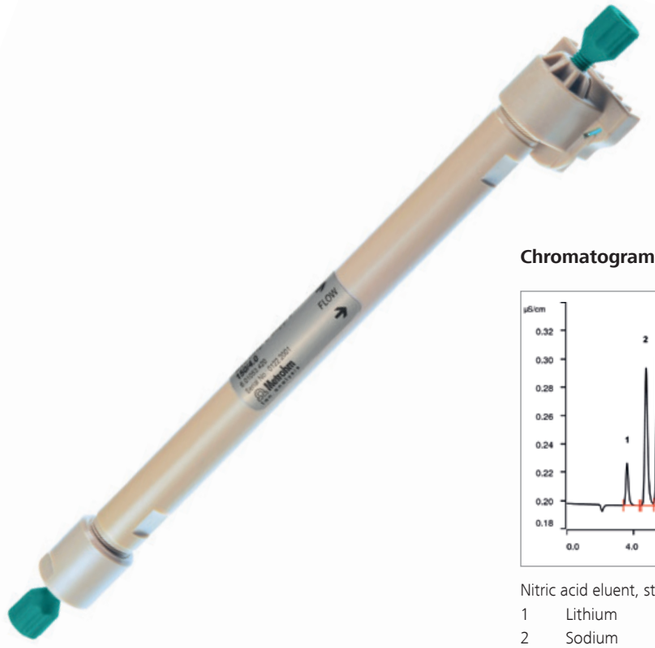
Preparation:
Rinse the column with eluent for 3 h.

Regeneration:
1. Disconnect the column outlet from the downstream function units such as suppressor or detector and collect the flow of liquid in a beaker instead.
2. Depending on the type of contamination, proceed in accordance with one of the following instructions:

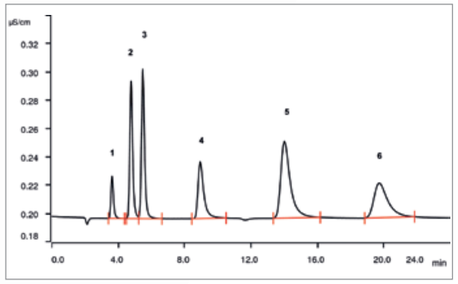
a. Organic contaminations:
Regenerate the column in the direction opposite to the flow at a flow rate of 1.0 mL/min with the following solutions in succession:
1. 1 h with ultrapure water
2. 1 h with acetonitrile-water mixture (40:60)
3. 1 h with ultrapure water

b. Inorganic contaminations:
Regenerate the column in the direction opposite to the flow at a flow rate of 1.0 mL/min for 1 h with 50 mmol/L nitric acid.

Storage
Store the column in standard eluent at ambient temperature.

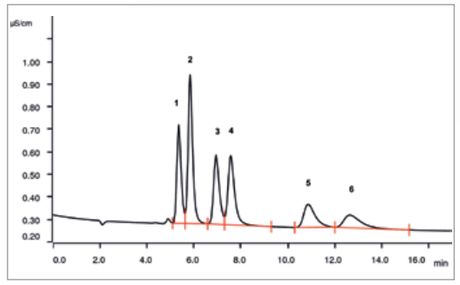


Chromatograms



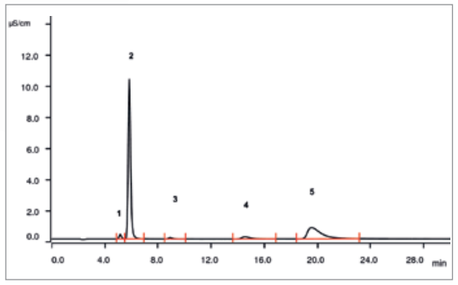
Nitric acid eluent, standard, 40 °C

		Conc. (mg/L)			Conc. (mg/L)
1	Lithium	1.00	4	Potassium	10.00
2	Sodium	5.00	5	Magnesium	10.00
3	Ammonium	5.00	6	Calcium	10.00



Nitric acid eluent, amines, 60 °C

		Conc. (µg/L)			Conc. (µg/L)
1	Monoethanolamine	2.0	4	Dimethylamine	2.0
2	Monomethylamine	2.0	5	Trimethylamine	2.0
3	Monoethylamine	2.0	6	Diethylamine	2.0



Nitric acid eluent, rain water, 40 °C

		Conc. (µg/L)			Conc. (µg/L)
1	Sodium	0.08	4	Magnesium	0.09
2	Ammonium	1.56	5	Calcium	1.06
3	Potassium	0.07			

Ordering information

Metrosep C Supp 2 - 150/4.0	6.01053.420
Metrosep C Supp 2 Guard/4.0	6.01053.500

Metrosep C Supp 2 - 250/4.0 (6.01053.430)

The longest separation column in the Metrosep C Supp 2 product range is the Metrosep C Supp 2 - 250/4.0. The Metrosep C Supp 2 separation material is based on a poly(styrene-co-divinylbenzene) copolymer with carboxyl groups. Thanks to the optimized sodium/ammonium separation of this separation material, this column is perfectly suitable for determination of the smallest concentrations of ammonium in addition to a large amount of sodium. The column is used with sequential suppression. It is accordingly particularly suitable for determining concentrations in the middle µg/L range and below.

Applications

- Li^+, Na^+, K^+, Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, NH_4^+
- Samples with low concentrations
- Good Na^+/NH_4^+ separation
- Low limits of detection
- Transition metals
- Excellent peak shape
- Matrix with high pH

Technical information

Substrate	Poly(styrene-co-divinylbenzene) copolymer with carboxyl groups
Column dimensions	250 x 4.0 mm
Column body	PEEK
Standard flow	1.0 mL/min
Maximum flow	2.0 mL/min
Maximum pressure	25 MPa
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone and acetonitrile (no alcohol) Sample: 0–100% acetone, acetonitrile and alcohols
pH range	Eluent: 0–12 Sample: 0–14
Temperature range	10–60 °C
Standard temperature	40 °C
Capacity	58 µmol (K^+)

Eluents

Nitric acid eluent (modified)	Nitric acid (c = 1 mol/L)	14 mL/2 L	7.0 mmol/L
	Rubidium	172.5 µg/2 L ($RbNO_3$)	50 µg/L Rb^+
	Acetonitrile	40 mL/2 L	2%
Gradient: Eluent A	Nitric acid (c = 1 mol/L)	2.5 mL/2 L	1.25 mmol/L
	Rubidium	43.1 µg/2 L ($RbNO_3$)	12.5 µg/L Rb^+
Eluent B	Nitric acid (c = 1 mol/L)	25 mL/2 L	12.5 mmol/L
	Rubidium	431 µg/2 L ($RbNO_3$)	125 µg/L Rb^+

Care

Note:
Ensure that the maximum pressure is never exceeded during regeneration. If the pressure becomes too high, reduce the flow rate.

Preparation:
Rinse the column with eluent for 3 h.

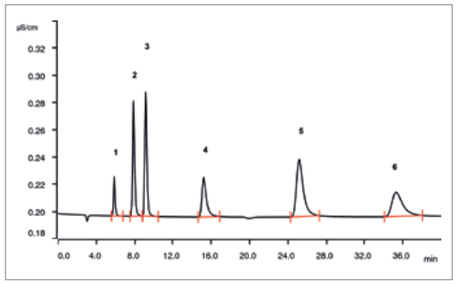
Regeneration:
1. Disconnect the column outlet from the downstream function units such as suppressor or detector and collect the flow of liquid in a beaker instead.
2. Depending on the type of contamination, proceed in accordance with one of the following instructions:

a. Organic contaminations:
Regenerate the column in the direction opposite to the flow at a flow rate of 1.0 mL/min with the following solutions in succession:
1. 1 h with ultrapure water
2. 1 h with acetonitrile-water mixture (40:60)
3. 1 h with ultrapure water

b. Inorganic contaminations:
Regenerate the column in the direction opposite to the flow at a flow rate of 1.0 mL/min for 1 h with 50 mmol/L nitric acid.

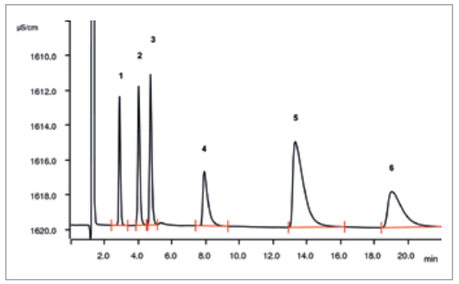
Storage
Store the column in standard eluent at ambient temperature.

Chromatograms



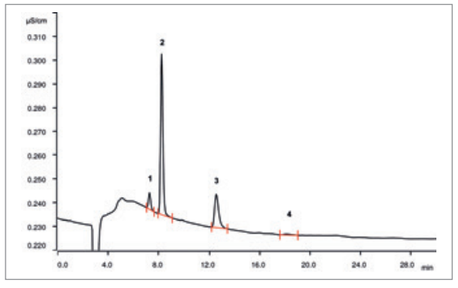
Nitric acid eluent, standard, 40 °C — Conc. (µg/L)

1	Lithium	25	4	Potassium	250
2	Sodium	125	5	Magnesium	250
3	Ammonium	125	6	Calcium	250



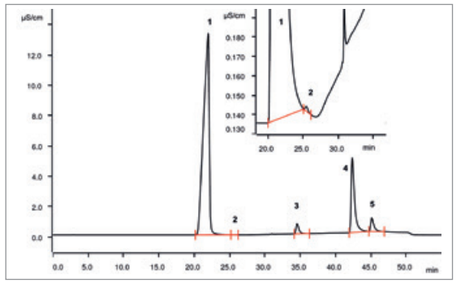
Nitric acid eluent, standard, non-suppressed, 40 °C — Conc. (mg/L)

1	Lithium	1	4	Potasssium	20
2	Sodium	10	5	Magnesium	20
3	Ammonium	10	6	Calcium	20



Nitric acid eluent, (2% acetonitrile), hydrogen peroxide, 50 °C — Conc. (mg/L)

1	Sodium	n.q.	3	Potassium	n.q.
2	Ammonium	n.q.	4	Trimethylamine	0.17



Nitric acid eluent, waste water, 40 °C — Conc. (mg/L)

1	Sodium	12076	4	Magnesium	1377.2
2	Ammonium	1.2	5	Calcium	435.2
3	Potassium	432.5			

Ordering information

Metrosep C Supp 2 - 250/4.0	6.01053.430
Metrosep C Supp 2 Guard/4.0	6.01053.500

Separation columns

Separation column for the determination of organic substances

MetroSil RP 3 - 150/4.0 (6.01070.420)

The MetroSil RP 3 - 150/4.0 is a reversed phase column with medium capacity which can be used universally with aqueous eluents as well as with aqueous samples. This property is especially important for applications in ion chromatography. The MetroSil RP 3 - 150/4.0 can be used to solve application problems which lie in the transition area between high-performance liquid chromatography and ion chromatography. The MetroSil RP 3 material is an "endcapped" C18 silica gel with a pore width of 120 angstroms.

Applications

- Determination of organic substances with low polarity and low charge
- Caffeine
- Determination of pharmaceutical products
- NTA, EDTA, DTPA (with UV/VIS detection)

Technical information

Substrate	Silica gel C_{18}
Column dimensions	150 x 4.0 mm
Column body	Stainless steel
Standard flow	0.7 mL/min
Maximum flow	5.0 mL/min
Maximum pressure	40 MPa
Particle size	5 µm
Organic modifier	0–100%
pH range	2–9
Temperature range	10–70 °C

Eluents

Acetonitrile/water	Acetonitrile	300 mL/2 L	15%
(standard eluent)	Water	1700 mL/2 L	85%
Nitrate/sulfuric acid/	Potassium nitrate	4.044 g/2 L	20 mmol/L
Methanol (phenol eluent)	Sulfuric acid (c = 1 mol/L)	1.0 mL/2 L	0.5 mmol/L
	Methanol	1000 mL/2 L	50%
Acetonitrile/water/sulfuric acid	Acetonitrile	300 mL/2 L	15%
(paracetamol eluent)	Water	1660 mL/2 L	85%
	Sulfuric acid (c = 1 mol/L)	40 mL/2 L	20 mmol/L

Care

Regeneration

Rinse for 15 min at 1.0 mL/min with each of the following: 100% water, followed by acetonitrile, isopropanol, hexane, isopropanol, and back to acetonitrile.

Storage

For short periods (< 48 h):

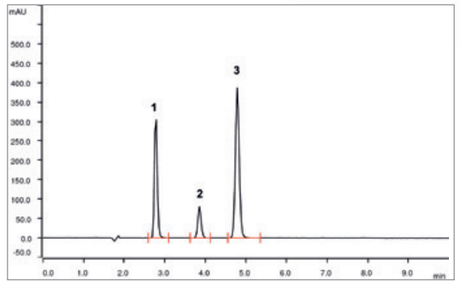
Rinse the column for 30 min at 0.5 mL/min with acetonitrile/water 50:50 (v:v).

For prolonged periods (> 48 h):

Rinse the column with water for 30 min at 0.5 mL/min.

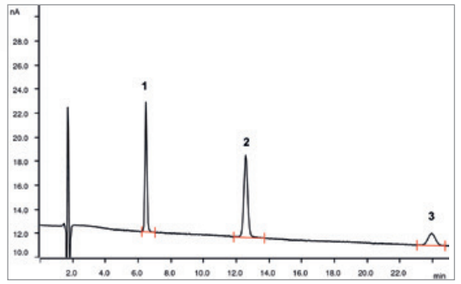
Rinse the column with acetonitrile for 30 min at 0.5 mL/min.

Chromatograms



Paracetamol eluent, standard, UV detection (λ = 256 nm)

		Conc. (mg/L)			Conc. (mg/L)
1	Paracetamol	20	3	2,6 Hydroxybenzoic acid	20
2	Caffeine	20			



Phenol eluent, standard, temperature 32 °C, amperometric detection

		Conc. (µg/L)			Conc. (µg/L)
1	Phenol	100	3	2,6 Dimethlyphenol	100
2	Cresol	100			

Ordering information

MetroSil RP 3 - 150/4.0	6.01070.420
MetroSil RP 3 - Guard/4.0	6.01070.500
Cartridge holder for MetroSil RP 3 Guard/4.0	6.02821.010

Guard columns

IC guard columns (precolumns)

Optimum protection for the separation columns, minimal dead volume, the same phase, and therefore nearly no influence on the chromatography are the characteristics of the Metrohm IC guard columns. They are extremely efficient, easy to handle and yet economical.

IC guard column cartridge for Hamilton PRP-X100 (6.1005.020)

For protecting Hamilton PRP-X100 columns. The cartridge efficiently removes contaminations in the form of particles due, for example, to the growth of bacteria and algae.

Applications
- Anions

Technical information

Column dimensions	20 x 4.0 mm
Column body	Stainless steel
Particle size	10 µm
Type	Cartridge

Ordering information

Guard column cartridge for Hamilton PRP-X100	6.1005.020
Guard cartridge holder, 20 mm	6.02821.000
For use with	
Hamilton PRP-X100 - 100/4.0	6.1005.000
Hamilton PRP-X100 - 250/4.0	6.1005.010

Super-Sep Guard/4.6 (6.1009.010)

For the protection of the Super-Sep - 100/4.6 analytical separation column

Applications
- Anions

Technical information

Column dimensions	12 x 4.6 mm
Column body	Stainless steel
Particle size	12 µm
Type	Column

Ordering information

Super-Sep Guard/4.6	6.1009.010
For use with	
Super-Sep - 100/4.6	6.1009.000

Metrosep Dual 4 Guard Column kit (6.1016.500)

Even if the Dual-4 columns based on monolithic silica gel are very durable, the use of the Dual 4 guard column is advised in order to increase the safety of the analytical separation column even more. The Dual 4 guard column is a PEEK cartridge which is also filled with monolithic silica gel. This cartridge is easy to replace and is screwed directly onto the analytical column in an aluminum holder. The proven «On Column Guard System» is simple to use and also offers the advantage of minimal dead volume.

Applications
- Anions

Technical information

Substrate	Monolithic silica gel
Column dimensions	5 x 4.6 mm
Column body	PEEK cartridge in an aluminum cartridge holder (replaceable)
Particle size	Monolith with 2 µm Macropores and 13 nm Mesopores
Organic modifier	0–5% methanol or acetonitrile only
pH range	0–8
Type	Cartridge

Ordering information

Guard column kit for the Metrosep Dual 4, comprised of three guard column cartridges and one guard column cartridge holder	6.1016.500
Guard column cartridges for the Metrosep Dual 4 (3 pcs.)	6.1016.510
For use with Metrosep Dual 4 - 100/4.6	6.1016.030

Metrosep A Supp 1 Guard/4.6 (6.1005.340)

The Metrosep A Supp 1 Guard/4.6 protects the Metrosep A Supp 1 - 250/4.6 separation column securely against contamination from particles and bacteria.

Applications
- Anions
- Oxhalogenides

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	50 x 4.6 mm
Column body	PEEK
Particle size	7 µm
Organic modifier	0–100%
pH range	0–13
Type	Column

Ordering information

Metrosep A Supp 1 Guard/4.6	6.1005.340
For use with Metrosep A Supp 1 - 250/4.6	6.1005.300

Metrosep A Supp 4 Guard/4.0 (6.01021.500)
Metrosep A Supp 4 S-Guard/4.0 (6.01021.510)

The Metrosep A Supp 4 Guard/4.0 reliably protects the Metrosep A Supp 4 - 250/4.0 anion column against contamination from the sample or eluent. It contains the same separation material as the Metrosep A Supp 4, is also made of PEEK, and is screwed directly onto the separation column with nearly no dead volume («On Column Guard System»). The guard column prolongs the lifetime of the analytical column, with practically no influence on its chromatographic separation performance. The economical price and simple handling make using the Metrosep A Supp 4 Guard/4.0 highly recommended.

Applications
- Anions

Technical information

Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	5 x 4.0 mm
Column body	PEEK
Particle size	9 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–12
Type	Column

Ordering information

Metrosep A Supp 4 Guard/4.0	6.01021.500
Metrosep A Supp 4 S-Guard/4.0	6.01021.510
For use with	
Metrosep A Supp 4 - 250/4.0	6.1006.430

Metrosep A Supp 4 Guard/2.0 (6.01021.600)

The Metrosep A Supp 4 Guard/2.0 reliably protects the Metrosep A Supp 4 microbore anion column against contamination from the sample or eluent. It contains the same separation material as the Metrosep A Supp 4, is also made of PEEK, and is screwed directly onto the separation column with nearly no dead volume («On Column Guard System»). The guard column prolongs the lifetime of the analytical column, with practically no influence on its chromatographic separation performance. The economical price and simple handling make using the Metrosep A Supp 4 Guard/2.0 highly recommended.

Applications
- Anions

Technical information

Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	5 x 2.0 mm
Column body	PEEK
Particle size	9 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–12
Type	Column

Ordering information

Metrosep A Supp 4 Guard/2.0	6.01021.600
For use with	
Metrosep A Supp 4 - 250/2.0	6.01021.230

Metrosep A Supp 5 Guard/4.0 (6.1006.500)
Metrosep A Supp 5 S-Guard/4.0 (6.1006.540)

The Metrosep A Supp 5 Guard/4.0 reliably protects the Metrosep A Supp 5 and 7 anion columns against contamination from the sample or eluent. It contains the same separation material as the Metrosep A Supp 5, is also made of PEEK, and is screwed directly onto the separation column with nearly no dead volume («On Column Guard System»). The guard column prolongs the lifetime of the analytical column, with practically no influence on its chromatographic separation performance. The economical price and simple handling make using the Metrosep A Supp 5 Guard/4.0 highly recommended.

Applications
- Anions

Technical information	
Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	5 x 4.0 mm
Column body	PEEK
Particle size	5 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–12
Type	Column

Ordering information	
Metrosep A Supp 5 Guard/4.0	6.1006.500
Metrosep A Supp 5 S-Guard/4.0	6.1006.540
For use with	
Metrosep A Supp 5 - 50/4.0	6.1006.550
Metrosep A Supp 5 - 100/4.0	6.1006.510
Metrosep A Supp 5 - 150/4.0	6.1006.520
Metrosep A Supp 5 - 250/4.0	6.1006.530
Metrosep A Supp 7 - 150/4.0	6.1006.620
Metrosep A Supp 7 - 250/4.0	6.1006.630

Metrosep A Supp 5 Guard/2.0 (6.1006.600)
Metrosep A Supp 5 S-Guard/2.0 (6.1006.610)

The Metrosep A Supp 5 Guard/2.0 reliably protects the Metrosep A Supp 5 and 7 microbore anion columns against contamination from the sample or eluent. It contains the same separation material as the Metrosep A Supp 5, is also made of PEEK, and is screwed directly onto the separation column with nearly no dead volume («On Column Guard System»). The guard column prolongs the lifetime of the analytical column, with practically no influence on its chromatographic separation performance. The economical price and simple handling make using the Metrosep A Supp 5 Guard/2.0 highly recommended.

Applications
- Anions

Technical information	
Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	5 x 2.0 mm
Column body	PEEK
Particle size	5 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–12
Type	Column

Ordering information	
Metrosep A Supp 5 Guard/2.0	6.1006.600
Metrosep A Supp 5 S-Guard/2.0	6.1006.610
For use with	
Metrosep A Supp 5 - 150/2.0	6.1006.220
Metrosep A Supp 5 - 250/2.0	6.1006.230
Metrosep A Supp 7 - 150/2.0	6.1006.640
Metrosep A Supp 7 - 250/2.0	6.1006.650

Metrosep A Supp 10 Guard/4.0 (6.1020.500)
Metrosep A Supp 10 S-Guard/4.0 (6.1020.510)
Metrosep A Supp 10 Guard HC/4.0 (6.1020.520)

The Metrosep A Supp 10 Guard/4.0 reliably protects the Metrosep A Supp 10 separation columns against contamination. Thanks to the «On Column Guard System», the guard column is very easy to handle. The guard column screws easily and directly onto the analytical column. No tools are required.

Applications
- Anions

Technical information	
Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	6.1020.500: 5 x 4.0 mm 6.1020.510: 5 x 4.0 mm 6.1020.520: 12.5 x 4.0 mm
Column body	PEEK
Particle size	4.6 µm
Organic modifier	0–100%
pH range	0–14
Type	Column

The Metrosep A Supp 10 Guard HC/4.0 is the high-capacity variant of the Metrosep A Supp 10 Guard/4.0.

The separation of cyclamate and phosphate is significantly improved when the Metrosep A Supp 5 - 100/4.0 (6.1006.510) is combined with the Metrosep A Supp 10 Guard HC/4.0.

Ordering information	
Metrosep A Supp 10 Guard/4.0	6.1020.500
Metrosep A Supp 10 S-Guard/4.0	6.1020.510
Metrosep A Supp 10 Guard HC/4.0	6.1020.520
For use with	
Metrosep A Supp 5 - 100/4.0 (with Metrosep A Supp 10 Guard HC/4.0; 6.1020.520)	6.1006.510
Metrosep A Supp 10 - 50/4.0	6.1020.050
Metrosep A Supp 10 - 75/4.0	6.1020.070
Metrosep A Supp 10 - 100/4.0	6.1020.010
Metrosep A Supp 10 - 250/4.0	6.1020.030

Metrosep A Supp 10 Guard/2.0 (6.1020.600)

The Metrosep A Supp 10 Guard/2.0 column reliably protects the Metrosep A Supp 10 microbore separation columns against contamination. Thanks to the «On Column Guard System», the guard column is very easy to handle. The guard column screws easily and directly onto the analytical column. No tools are required.

Applications
- Anions

Technical information	
Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	5 x 2.0 mm
Column body	PEEK
Particle size	4.6 µm
Organic modifier	0–100%
pH range	0–14
Type	Column

Ordering information	
Metrosep A Supp 10 Guard/2.0	6.1020.600
For use with	
Metrosep A Supp 10 - 50/2.0	6.1020.250
Metrosep A Supp 10 - 75/2.0	6.1020.270
Metrosep A Supp 10 - 100/2.0	6.1020.210
Metrosep A Supp 10 - 150/2.0	6.1020.220
Metrosep A Supp 10 - 250/2.0	6.1020.230

Metrosep A Supp 16 Guard/4.0 (6.1031.500)
Metrosep A Supp 16 S-Guard/4.0 (6.1031.510)

The Metrosep A Supp 16 Guard/4.0 reliably protects the Metrosep A Supp 16 analytical separation columns against contamination. Thanks to the «On Column Guard System», the guard column is very easy to handle. The guard column screws easily onto the analytical column. No tools are required.

Applications
- Anions

Technical information	
Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	5 x 4.0 mm
Column body	PEEK
Particle size	4.6 µm
Organic modifier	0–10%
pH range	0–14
Type	Column

Ordering information	
Metrosep A Supp 16 Guard/4.0	6.1031.500
Metrosep A Supp 16 S-Guard/4.0	6.1031.510
For use with	
Metrosep A Supp 16 - 100/4.0	6.1031.410
Metrosep A Supp 16 - 150/4.0	6.1031.420
Metrosep A Supp 16 - 250/4.0	6.1031.430
Metrosep A Supp 7 - 150/4.0	6.1006.620
Metrosep A Supp 7 - 250/4.0	6.1006.630

Metrosep A Supp 16 Guard/2.0 (6.1031.600)
Metrosep A Supp 16 S-Guard/2.0 (6.1031.610)

The Metrosep A Supp 16 Guard/2.0 reliably protects the Metrosep A Supp 16 analytical separation columns with 2 mm inner diameter against contamination. Thanks to the «On Column Guard System», the guard column is very easy to handle. The guard column screws easily onto the analytical column. No tools are required.

Applications
- For anions

Technical information	
Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	5 x 2.0 mm
Column body	PEEK
Particle size	4.6 µm
Organic modifier	0–10%
pH range	0–14
Type	Column

Ordering information	
Metrosep A Supp 16 Guard/2.0	6.1031.600
Metrosep A Supp 16 S-Guard/2.0	6.1031.610
For use with	
Metrosep A Supp 16 - 100/2.0	6.1031.210
Metrosep A Supp 16 - 150/2.0	6.1031.220
Metrosep A Supp 16 - 250/2.0	6.1031.230
Metrosep A Supp 7 - 150/2.0	6.1006.640
Metrosep A Supp 7 - 250/2.0	6.1006.650

Metrosep A Supp 17 Guard/4.0 (6.01032.500)
Metrosep A Supp 17 S-Guard/4.0 (6.01032.510)
Metrosep A Supp 17 S-Guard - 50/4.0 (6.01032.530)

The Metrosep A Supp 17 Guard/4.0 reliably protects the Metrosep A Supp 17 analytical separation columns against contamination. Thanks to the «On Column Guard System», the guard column is very easy to handle. The guard column screws easily onto the analytical column. No tools are required.

Applications
- Anions

Technical information	
Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	5 x 4.0 mm, and 50 x 4.0 mm respectively
Column body	PEEK
Particle size	5.0 µm
Organic modifier	0–100% methanol 0–40% acetone or acetonitrile
pH range	0–14
Type	Column

Ordering information	
Metrosep A Supp 17 Guard/4.0	6.01032.500
Metrosep A Supp 17 S-Guard/4.0	6.01032.510
Metrosep A Supp 17 S-Guard - 50/4.0	6.01032.530
For use with	
Metrosep A Supp 17 - 100/4.0	6.01032.410
Metrosep A Supp 17 - 150/4.0	6.01032.420
Metrosep A Supp 17 - 250/4.0	6.01032.430

Metrosep A Supp 18 Guard/4.0 (6.01033.500)

The Metrosep A Supp 18 Guard/4.0 reliably protects the Metrosep A Supp 18 analytical separation column against contamination from sample or eluent. It contains the same separation material as the Metrosep A Supp 18 IC Columns, is also made of PEEK, and is screwed directly onto the respective separating column with virtually no dead volume («On Column Guard System»). The guard column prolongs the service life of the analytical column, without influencing chromatographic separating efficiency.

Applications
- Anions

Technical information	
Substrate	Polyvinyl alcohol with quaternary ammonium groups
Column dimensions	5 x 4.0 mm
Column body	PEEK
Particle size	3.5 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	3–13
Type	Column

Ordering information	
Metrosep A Supp 18 Guard/4.0	6.01033.500
For use with	
Metrosep A Supp 18 - 150/4.0	6.01033.420
Metrosep A Supp 18 - 250/4.0	6.01033.430

Metrosep A Supp 19 Guard/4.0 (6.01034.500)

The Metrosep A Supp 19 Guard/4.0 reliably protects the anion separation columns of the Metrosep A Supp 19 product family against contaminations from the sample or eluent and thus prolong their service life significantly. The guard columns and separation columns of the Metrosep A Supp 19 product family are made of PEEK and filled with the same material. This ensures that the chromatographic separating efficiency is not restricted in any way.

The «On Column Guard System» makes it possible to screw the guard column onto the anion separation column directly and conveniently. The economical price and simple handling make the Metrosep A Supp 19 Guard/4.0 the ideal protection for the separation column.

Applications
- Anions

Technical information	
Substrate	Hydrophilized poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	5 x 4.0 mm
Column body	PEEK
Particle size	4.6 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	0–14
Type	Column

Ordering information	
Metrosep A Supp 19 Guard/4.0	6.01034.500
For use with	
Metrosep A Supp 19 - 100/4.0	6.01034.410
Metrosep A Supp 19 - 150/4.0	6.01034.420
Metrosep A Supp 19 - 250/4.0	6.01034.430

Metrosep A Supp 21 Guard/4.0 (6.01036.500)

The Metrosep A Supp 21 Guard/4.0 reliably protects the analytic Metrosep A Supp 21 IC Columns against contamination from the sample or eluent. It contains the same stationary phase as the Metrosep A Supp 21 IC Columns, which is packed in a PEEK guard column housing. As it is screwed directly onto the respective separation column, practically no dead volume is created («On Column Guard System»). The guard column prolongs the service life of the analytical column, without influencing chromatographic separating efficiency.

Applications
- Anions

Technical information	
Substrate	Hydrophilized poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	5 x 4.0 mm
Column body	PEEK
Particle size	4.6 µm
Organic modifier	0–100% (particularly acetone, acetonitrile, methanol)
pH range	0–14
Type	Column

Ordering information	
Metrosep A Supp 21 Guard/4.0	6.01036.500
For use with	
Metrosep A Supp 21 - 150/4.0	6.01036.420
Metrosep A Supp 21 - 250/4.0	6.01036.430

Metrosep Organic Acids Guard/4.6 (6.1005.250)

The Metrosep Organic Acids Guard/4.6 effectively removes contamination, thus protecting the analytical separation column.

Applications
- Organic acids

Technical information	
Substrate	Poly(styrene-co-divinylbenzene) with sulfonic acid groups
Column dimensions	50 x 4.6 mm
Column body	Stainless steel
Particle size	9 µm
Organic modifier	0–20%
pH range	1–13
Type	Column

Ordering information	
Metrosep Organic Acids Guard/4.6	6.1005.250
For use with	
Metrosep Organic Acids - 100/7.8	6.1005.210
Metrosep Organic Acids - 250/7.8	6.1005.200

Metrosep Carb 2 Guard/4.0 (6.1090.500)
Metrosep Carb 2 S-Guard/4.0 (6.1090.510)

The Metrosep Carb 2 Guard/4.0 and the the Metrosep Carb 2 S-Guard/4.0 effectively remove contaminations, thus protecting the analytical separation column. The design of the guard column has been selected in such a way that its influence on chromatographic separation can be ignored.

Applications
- Carbohydrates

Technical information	
Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	5 x 4.0 mm
Column body	PEEK
Particle size	5 µm
Organic modifier	0–50% acetonitrile or methanol (eluent) 0–100% acetone, acetonitrile or methanol (sample)
pH range	0–14
Type	Column

Ordering information	
Metrosep Carb 2 Guard/4.0	6.1090.500
Metrosep Carb 2 S-Guard/4.0	6.1090.510
For use with	
Metrosep Carb 2 - 100/4.0	6.1090.410
Metrosep Carb 2 - 150/4.0	6.1090.420
Metrosep Carb 2 - 250/4.0	6.1090.430

Metrosep Carb 2 Guard/2.0 (6.01090.600)

The Metrosep Carb 2 Guard/2.0 microbore guard column effectively removes contamination, thus protecting the analytical separation column. The design of the guard column has been selected in such a way that its influence on the chromatographic separation can be ignored.

Applications
- Carbohydrates

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	5 x 2.0 mm
Column body	PEEK
Particle size	5 µm
Organic modifier	0–50% acetonitrile or methanol (eluent) 0–100% acetone, acetonitrile or methanol (sample)
pH range	0–14
Type	Column

Ordering information

Metrosep Carb 2 Guard/2.0	6.01090.600
For use with	
Metrosep Carb 2 - 100/2.0	6.01090.210
Metrosep Carb 2 - 150/2.0	6.01090.220
Metrosep Carb 2 - 250/2.0	6.01090.230

Nucleosil 5SA 2 Guard Cartridge/4.0 (6.1007.110)

For the protection of the Nucleosil 5SA - 125/4.0 analytical separation column. Requires the 6.2821.140 holder for connection to the separation column.

Applications
- Cations

Technical information

Substrate	Spherical silica gel with sulfonic acid groups
Column dimensions	20 x 4.0 mm
Column body	Stainless steel
Particle size	5 µm
Type	Cartridge

Ordering information

Nucleosil 5SA 2 Guard Cartridge/4.0	6.1007.110
Holder to Nucleosil 5SA 2 Guard Cartridge/4.0	6.2821.140
For use with	
IC Cation Column Nucleosil 5SA - 125/4.0	6.1007.000

Metrosep C 3 Guard/4.0 (6.1010.450)
Metrosep C 3 S-Guard/4.0 (6.1010.460)

The Metrosep C 3 Guard/4.0 contains the Metrosep C 3 column material and is used to protect Metrosep C 3 cation columns. Particles and contaminations are reliably retained, considerably prolonging the service life of the analytical separation column. The Metrosep C 3 Guard/4.0 also works based on the «On Column Guard System» and is screwed directly onto the separation column with nearly no dead volume.

Applications
- Cations

Technical information	
Substrate	Polyvinyl alcohol with carboxyl groups
Column dimensions	5 x 4.0 mm
Column body	PEEK
Particle size	5 µm
Organic modifier	50% acetonitrile or 30% acetone (no methanol)
pH range	2–12
Type	Column

Ordering information	
Metrosep C 3 Guard/4.0	6.1010.450
Metrosep C 3 S-Guard/4.0	6.1010.460
For use with	
Metrosep C 3 - 100/4.0	6.1010.410
Metrosep C 3 - 150/4.0	6.1010.420
Metrosep C 3 - 250/4.0	6.1010.430

Metrosep C 4 Guard/4.0 (6.1050.500)
Metrosep C 4 S-Guard/4.0 (6.1050.510)
Metrosep C 4 S-Guard - 50/4.0 (6.1050.530)

The Metrosep C 4 Guard/4.0 contains the Metrosep C 4 column material and is used to protect all Metrosep cation columns that have a substrate based on silica gel. Particles and contaminations are reliably retained, considerably prolonging the service life of the analytical separation column. The economical price is an additional plus. The Metrosep C 4 Guard/4.0 works based on the «On Column Guard System» and is screwed directly onto the separation column with nearly no dead volume. In comparison with the standard Metrosep C 4 guard columns, the Metrosep C 4 S-Guard - 50/4.0 exhibits greater capacity and therefore an even longer service life.

Applications
- Cations

Technical information	
Substrate	Silica gel with carboxyl groups
Column dimensions	5 x 4.0 mm, and 50 x 4.0 mm respectively
Column body	PEEK
Particle size	5 µm
Organic modifier	0–100% (no methanol)
pH range	2–7
Type	Column

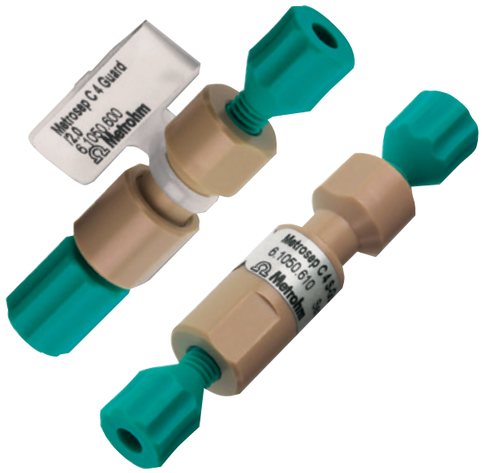
Ordering information	
Metrosep C 4 Guard/4.0	6.1050.500
Metrosep C 4 S-Guard/4.0	6.1050.510
Metrosep C 4 S-Guard - 50/4.0	6.1050.530
For use with	
Metrosep C 4 - 50/4.0	6.1050.450
Metrosep C 4 - 100/4.0	6.1050.410
Metrosep C 4 - 150/4.0	6.1050.420
Metrosep C 4 - 250/4.0	6.1050.430

Metrosep C 4 Guard/2.0 (6.1050.600)
Metrosep C 4 S-Guard/2.0 (6.1050.610)

The Metrosep C 4 Guard/2.0 contains the Metrosep C 4 column material and is used to protect all Metrosep cation columns with 2 mm inner diameter which have a substrate based on silica gel. Particles and contaminations are reliably retained, considerably prolonging the service life of the analytical separation column. The economical price is an additional plus. The Metrosep C 4 Guard/2.0 works based on the «On Column Guard System» and is screwed directly onto the separation column with nearly no dead volume.

Applications
- Cations

Technical information	
Substrate	Silica gel with carboxyl groups
Column dimensions	5 x 2.0 mm
Column body	PEEK
Particle size	5 µm
Organic modifier	0–100% (no methanol)
pH range	2–7
Type	Column



Ordering information	
Metrosep C 4 Guard/2.0	6.1050.600
Metrosep C 4 S-Guard/2.0	6.1050.610
For use with	
Metrosep C 4 - 100/2.0	6.1050.210
Metrosep C 4 - 150/2.0	6.1050.220
Metrosep C 4 - 250/2.0	6.1050.230

Metrosep C 6 Guard/4.0 (6.1051.500)
Metrosep C 6 S-Guard/4.0 (6.1051.510)

The Metrosep C 6 Guard/4.0 contains the Metrosep C 6 column material and is used to protect against particles and contamination. This considerably lengthens the service life of the analytical separation column.. The economical price is an additional plus. The Metrosep C 6 Guard/4.0 works based on the «On Column Guard System» and is screwed directly onto the separation column with nearly no dead volume.

Applications
- Cations

Technical information	
Substrate	Silica gel with carboxyl groups
Column dimensions	5 x 4.0 mm
Column body	PEEK
Particle size	5 µm
Organic modifier	0–100% (no alcohol)
pH range	2–7
Type	Column

Ordering information	
Metrosep C 6 Guard/4.0	6.1051.500
Metrosep C 6 S-Guard/4.0	6.1051.510
For use with	
Metrosep C 6 - 100/4.0	6.1051.410
Metrosep C 6 - 150/4.0	6.1051.420
Metrosep C 6 - 250/4.0	6.1051.430

Metrosep C 6 Guard/2.0 (6.01051.600)

The Metrosep C 6 Guard/2.0 contains the Metrosep C 6 column material and is used to protect against particles and contamination. This considerably lengthens the service life of the analytical separation column. The economical price is an additional plus. The Metrosep C 6 Guard/2.0 works based on the «On Column Guard System» and is screwed directly onto the separation column with nearly no dead volume.

Applications
- Cations

Technical information

Substrate	Silica gel with carboxyl groups
Column dimensions	5 x 2.0 mm
Column body	PEEK
Particle size	5 µm
Organic modifier	0–100% (no alcohol)
pH range	2–7
Type	Column

Ordering information

Metrosep C 6 Guard/2.0	6.01051.600
For use with	
Metrosep C 6 - 100/2.0	6.01051.210
Metrosep C 6 - 150/2.0	6.01051.220
Metrosep C 6 - 250/2.0	6.01051.230

Metrosep C Supp 1 Guard/4.0 (6.1052.500)

The Metrosep C Supp 1 Guard/4.0 contains the Metrosep C Supp 1 column material and is used to protect Metrosep C Supp 1 cation columns. Particles and contaminations are reliably retained, considerably prolonging the service life of the analytical separation column. The Metrosep C Supp 1 Guard/4.0 also functions according to the "On Column Guard System" and is screwed directly onto the separation column with nearly no dead volume.

Applications
- Cations

Technical information

Substrate	Polyvinyl alcohol with carboxyl groups
Column dimensions	5 x 4.0 mm
Column body	PEEK
Particle size	5 µm
Organic modifier	50 % Acetonitril or 30 % Aceton
pH range	1–12
Type	Column

Ordering information

Metrosep C Supp 1 Guard/4.0	6.1052.500
For use with	
Metrosep C Supp 1 - 100/4.0	6.1052.410
Metrosep C Supp 1 - 150/4.0	6.1052.420
Metrosep C Supp 1 - 250/4.0	6.1052.430

Metrosep C Supp 2 Guard/4.0 (6.01053.500)

The Metrosep C Supp 2 Guard/4.0 contains the Metrosep C Supp 2 column material and is used to protect Metrosep C Supp 2 cation columns. Particles and contamination are reliably retained, considerably prolonging the service life of the analytical separation column. The Metrosep C Supp 2 Guard/4.0 also functions according to the "On Column Guard System" and is screwed directly onto the separation column with nearly no dead volume.

Applications
- Cations

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with carboxyl groups
Column dimensions	5 x 4.0 mm
Column body	PEEK
Particle size	5 µm
Organic modifier	Eluent: 0–100% acetone, acetonitrile (no alcohol) Sample: 0–100% aceton, acetonitrile, alcohols
pH range	Eluent: 0–12 Sample: 0–14
Type	Column

Ordering information

Metrosep C Supp 2 Guard/4.0	6.01053.500
For use with	
Metrosep C Supp 2 - 100/4.0	6.01053.410
Metrosep C Supp 2 - 150/4.0	6.01053.420
Metrosep C Supp 2 - 250/4.0	6.01053.430

Metrosep RP 2 Guard/3.5 (6.1011.030)

The Metrosep RP 2 Guard/3.5 is a guard column for universal use. It reliably protects the analytical separation column against contamination, removing the smallest particles, traces of iron oxide, and bacteria. The Metrosep RP 2 Guard/3.5 helps to reduce costs; its filter disk can be replaced very easily.

Applications
- Universal guard column

Technical information

Substrate	Polymer
Column dimensions	1.0 x 3.5 mm
Column body	PEEK
Pore size	0.2 µm
Organic modifier	0–100%
pH range	1–13
Type	Column

Ordering information

Metrosep RP 2 Guard/3.5	6.1011.030
Replacement filters for RP 2 Guard/3.5 (10 pcs.)	6.1011.130
For use with	
Metrosep A Supp 1 HS - 50/4.6	6.1005.350
Metrosep A Supp 3 - 250/4.6	6.1005.320
Hamilton PRP-X300 - 250/4.6	6.1005.030
Hamilton RCX-30 - 250/4.6	6.1018.000
Metrosep Amino Acids 1 - 100/4.0	6.4001.410

Metrosep RP 3 Guard HC/4.0 (6.1011.040)

The Metrosep RP 3 Guard HC/4.0 is a guard column for universal use. It reliably protects the analytical separation column against contamination, securely removing lipophilic organic contamination, the smallest particles, traces of iron oxide and bacteria. The guard column is based on a polymer material and thanks to its larger pack volume, has a significantly higher capacity that the Metrosep RP 2 Guard/3.5. It can be used throughout the entire pH range.

Applications
- Universal guard column

Technical information

Substrate	Poly(styrene-co-divinylbenzene)
Column dimensions	5 x 4.0 mm
Column body	PEEK
Organic modifier	0–100%
pH range	1–14
Type	Column

Ordering information

Metrosep RP 3 Guard HC/4.0	6.1011.040
For use with	
Metrosep A Supp 1 HS - 50/4.6	6.1005.350
Metrosep A Supp 3 - 250/4.6	6.1005.320
Hamilton PRP-X300 - 250/4.6	6.1005.030
Hamilton RCX-30 - 250/4.6	6.1018.000
Metrosep Amino Acids 1 - 100/4.0	6.4001.410

MetroSil RP 3 Guard/4.0 (6.01070.500)

The MetroSil RP 3 Guard/4.0 is used to protect the MetroSil RP 3 - 150/4.0 against contamination from particles and bacteria.

Applications
- Organic substances

Technical information

Substrate	Silica gel C_{18}
Column dimensions	14 x 4.0 mm
Column body	Stainless steel
Particle size	5 µm
Organic modifier	0–100%
pH range	2–9
Type	Cartridge

Ordering information

MetroSil RP 3 Guard/4.0	6.01070.500
Cartridge holder for MetroSil RP 3 Guard/4.0	6.02821.010
For use with	
MetroSil RP 3 - 150/4.0	6.01070.420

Metrosep BP 1 Guard/2.0 (6.1015.100)

The Metrosep BP 1 Guard/2.0 is used to generate a sufficiently high working pressure in the flow path of post-column reagents. They are used in combination with a high-pressure pump for conveying the post-column reagent in the Professional Reactor.

Applications

- Backpressure column

Technical information

Substrate	Diamond
Column dimensions	50 x 2.0 mm
Column body	PEEK
Particle size	6–10 µm
Organic modifier	0–100%
Type	Column

Ordering information

Metrosep BP 1 Guard/2.0	6.1015.100

Preconcentration columns

Metrosep A PCC 2/4.0 (6.1006.330), Metrosep A PCC 2 HC/4.0 (6.1006.340), and Metrosep A PCC 2 VHC/4.0 (6.1006.350)

The Metrosep A PCC 2/4.0 is used for the preconcentration of anions from small sample volumes. The small dead volume of the column guarantees an excellent peak shape.

The Metrosep A PCC 2 HC/4.0 and the Metrosep A PCC 2 VHC/4.0, on the other hand, are high-capacity preconcentration columns for anions. They are used primarily where large sample volumes with very low anion concentrations must be preconcentrated. The high capacity prevents premature elution of the anions by the matrix itself (in most cases water). Reliable determinations can now be made using these high-capacity columns. All preconcentration columns are made of PEEK.

Applications

- Preconcentration of anions

Technical information

Substrate	Polymethacrylate with quaternary ammonium groups
Column dimensions	6.1006.330: 1.0 x 4.0 mm 6.1006.340: 13.0 x 4.0 mm 6.1006.350: 30.0 x 4.0 mm
Column body	PEEK
Maximum flow	5.0 mL/min
Maximum pressure	20 MPa
Particle size	65 µm
Organic modifier	Eluent: 0–10% (acetone, acetonitrile, methanol, isopropanol) Sample: 0–100% (acetone, acetonitrile, methanol, isopropanol)
pH range	2–13
Type	Column
Capacity	6.1006.330: 0.5 µmol (Cl^-) 6.1006.340: 5 µmol (Cl^-) 6.1006.350: 10 µmol (Cl^-)

Care

Storage
In the eluent

Ordering information

Metrosep A PCC 2/4.0	6.1006.330
Metrosep A PCC 2 HC/4.0	6.1006.340
Metrosep A PCC 2 VHC/4.0	6.1006.350

Metrosep C PCC 1/4.0 (6.1010.300), Metrosep C PCC 1 HC/4.0 (6.1010.310), and Metrosep C PCC 1 VHC/4.0 (6.1010.320)

The Metrosep C PCC 1/4.0 in the various versions are suitable for the preconcentration of monovalent and divalent cations. They are used primarily where large sample volumes with very low cation concentrations must be preconcentrated. In addition, they fulfill the function of a trap column when working with matrix elimination, i.e. the cations to be determined are held back and allow the removal of the disruptive matrix before the sample is fed to the IC system.

The greater the capacity of the column (in the first approximation, this is proportional to the length of the packing bed) the larger the sample volume which can be preconcentrated. This allows detection limits into the lower ppt range. On the other hand, the packing bed increases the dead volume of the preconcentration column; with increasing size the injection peak in the chromatogram increases in peak area. Three different capacities provide the needed flexibility for all preconcentration tasks.

The preconcentration columns are distinguished by very low noise and very low backpressure. They are suitable for preconcentration using a peristaltic pump or Metrohm Dosino technology.

Applications

- Preconcentration of cations

Technical information

Substrate	Polymethacrylate with carboxyl groups
Column dimensions	6.1010.300: 8.5 x 4.0 mm 6.1010.310: 16.5 x 4.0 mm 6.1010.320: 30.0 x 4.0 mm
Column body	PEEK
Maximum pressure	15 MPa
Particle size	35 µm
Organic modifier	0–20% methanol, ethanol, isopropanol or acetonitrile
pH range	1–14
Type	Column
Preconcentration volume*	6.1010.300: 20 mL 6.1010.310: 60 mL 6.1010.320: 90 mL

* A solution was preconcentrated with Li^+ = 2 µg/L, Na^+, NH_4^+ = 10 µg/L and K^+ = 20 µg/L. The maximum preconcentration volume is determined by the fact that the peak area of the lithium does not continue to increase. This means that at greater volumes the lithium is already eluting again from the column.

Care

Storage
In the eluent

Ordering information

Metrosep C PCC 1/4.0	6.1010.300
Metrosep C PCC 1 HC/4.0	6.1010.310
Metrosep C PCC 1 VHC/4.0	6.1010.320

Metrosep Chel PCC 1 VHC/4.0 (6.01010.350)

The Metrosep Chel PCC 1 VHC/4.0 is a preconcentration column for the preconcentration of all kinds of cations. Due to its chelating exchanger group, it is particularly well suited for the preconcentration of polyvalent cations. Earthalkaline metals and transition metals are retained much stronger on the preconcentration column than the alkaline metals. Using matrix elimination, it is possible to remove the disturbing monovalent cations from the preconcentration column prior to injection onto the separation column.

The chelating exchange group allows the determination of transition metals in the ppb range in matrices with high salt contents.

Applications

- Preconcentration of transition metal ions and polyvalent cations.

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with chelating exchanger groups
Column dimensions	30 x 4.0 mm
Column body	PEEK
Maximum pressure	20 MPa
Particle size	30 µm
Maximum flow	2.0 mL/min
Organic modifier	0–50% acetonitrile, acetone, methanol
pH range	1–13
Type	Column

Care

Storage:
In 5 mmol/L nitric acid.

Ordering information

Metrosep Chel PCC 1 VHC/4.0	6.01010.350

IC trap columns

Metrosep A Trap 1 - 100/4.0 (6.1014.000)

The Metrosep A Trap 1 - 100/4.0 is a high capacity anion column, which is used to purify the eluent flow. Even reagents of the highest quality, e.g. «ultrapure» or «puriss.» can still contain minimal anionic contaminants. These are reliably held back by the Metrosep A Trap 1 - 100/4.0. This column is primarily used with gradient applications.

Applications
- Purification of the anion eluent flow

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with quaternary ammonium groups
Column dimensions	100 x 4.0 mm
Column body	PEEK
Maximum pressure	25 MPa
Particle size	570 µm
Organic modifier	0–20%
pH range	1–14
Type	Column

Care

Regeneration

a) First rinse with 30 mL 0.5 mol/L Na_2CO_3 at a flow rate of 1.0 mL/min.
b) Then rinse with 30 mL ultrapure water at a flow of 1.0 mL/min.

Storage

In the eluent

Ordering information

Metrosep A Trap 1 - 100/4.0	6.1014.000

Metrosep C Trap 1 - 100/4.0 (6.1015.000)

This is a high capacity cation column, which is used to purify the eluent flow. Even reagents of the highest quality, e.g. «ultrapure» or «puriss.» can still contain minimal cationic contaminants. These are reliably held back by the Metrosep C Trap 1 - 100/4.0.

Applications
- Purification of the cation eluent flow

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with sulfonic acid groups
Column dimensions	100 x 4.0 mm
Column body	PEEK
Maximum pressure	25 MPa
Particle size	37–74 µm
Organic modifier	0–20%
pH range	1–14
Type	Column

Care

Regeneration

a) First rinse with 20 mL of 5% H_2SO_4 at a flow of 1.0 mL/min.
b) Then rinse with 15 mL ultrapure water at a flow of 1.0 mL/min.

Storage

In the eluent

Ordering information

Metrosep C Trap 1 - 100/4.0	6.1015.000

Metrosep C Trap 1 - 30/4.0 (6.01015.030)

This is a cation column, which is used to purify the eluent flow. Even reagents of the highest quality, e.g. «ultrapure» or «puriss.» can still contain minimal cationic contaminants. These are reliably held back by the Metrosep C Trap 1 - 30/4.0. The small dimension of the trap column reduces the dead volume of the instrument.

Applications
- Purification of the cation eluent flow

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with sulfonic acid groups
Column dimensions	30 x 4.0 mm
Column body	PEEK
Maximum pressure	25 MPa
Particle size	37–74 µm
Organic modifier	0–20%
pH range	1–14
Type	Column

Care

Regeneration

a) First rinse with 20 mL of 5% H_2SO_4 at a flow of 1.0 mL/min.
b) Then rinse with 15 mL ultrapure water at a flow of 1.0 mL/min.

Storage

In the eluent

Ordering information

Metrosep C Trap 1 - 30/4.0	6.01015.030

Metrosep RP Trap 1 - 50/4.0 (6.1014.100)

The Metrosep RP Trap 1 - 50/4.0 column is used to eliminate organic contaminants from the eluent. The Metrosep RP Trap 1 - 50/4.0 column helps avoid eluent-related interference at the baseline, especially with gradient systems. Its use is also recommended for the purification of the p-cyanophenol eluent of the Metrosep Dual 4 separation columns.

Applications
- Purification of the eluent flow

Technical information

Substrate	Silica gel
Column dimensions	50 x 4.0 mm
Column body	PEEK
Maximum pressure	25 MPa
Particle size	10 µm
pH range	1–9
Type	Column

Care

Regeneration

a) Rinse with 10 mL 80% acetonitrile/water at a flow rate of 2.0 mL/min.
b) Rinse with 20 mL 100% acetonitrile at a flow rate of 2.0 mL/min.
c) Rinse with 10 mL 80% acetonitrile/water at a flow rate of 2.0 mL/min.

Note

If the Metrosep RP Trap 1 - 50/4.0 is used with the Metrosep Dual 4 (6.1016.0X0), then it must be rinsed with 40 mL water at a flow rate of 2.0 mL/min after the regeneration.

Storage

In the eluent

Ordering information

Metrosep RP Trap 1 - 50/4.0	6.1014.100
For use with	
Metrosep Dual 4 - 100/4.6	6.1016.030

Metrosep RP Trap 2 - 100/4.0 (6.1014.150)

The Metrosep RP Trap 2 - 100/4.0 column is used to eliminate organic contaminants from the eluent. The Metrosep RP Trap 2 - 100/4.0 column helps avoid eluent-related interference at the baseline, especially with gradient systems. It is based on a polymer material. Its presence enables the use of the Metrosep RP Trap 2 - 100/4.0 in the acidic as well as in the alkaline pH range.

Applications

- Elimination of organic contamination from the eluent.

Technical information

Substrate	Poly(styrene-co-divinylbenzene)
Column dimensions	100 x 4.0 mm
Column body	PEEK
Maximum pressure	25 MPa
pH range	1–14
Type	Column

Storage
In ultrapure water

Ordering information

Metrosep RP Trap 2 - 100/4.0	6.1014.150

Metrosep I Trap 1 - 100/4.0 (6.1014.200)

The Metrosep I Trap 1 - 100/4.0 column is used to eliminate ionic, i.e. cationic and anionic, contaminants from aqueous solutions. Its use is especially recommended for the purification of the transfer water in combination with «MISP» (Metrohm Inline Sample Preparation). Using the Metrosep I Trap 1 - 100/4.0 column can significantly reduce the influence of the transfer water on the system blank.

Applications

- For the elimination of traces of anionic and cationic contaminants from ultrapure water

Technical information

Substrate	Poly(styrene-co-divinylbenzene) with anionic and cationic ion exchangers
Column dimensions	100 x 4.0 mm
Column body	PEEK
Maximum pressure	25 MPa
Particle size	300–840 µm
Organic modifier	0–100%
pH range	0–14
Type	Column

Care
Regeneration
not possible

Storage
in ultrapure water

Ordering information

Metrosep I Trap 1 - 100/4.0	6.1014.200

Metrosep BO_3^{3-} Trap 1 - 100/4.0 (6.1015.200)

Trap column for the removal of borate contaminants from the eluent. The Metrosep BO_3^{3-} Trap 1 - 100/4.0 is mainly used in carbohydrate analysis with hydroxide eluents. The removal of borate from the eluent improves the peak shape of sorbitol.

Applications

- Elimination of borate traces from hydroxide eluents.

Technical information

Substrate	Poly(styrene-co-divinylbenzene)
Column dimensions	100 x 4.0 mm
Column body	PEEK
Maximum pressure	25 MPa
pH range	0–14
Type	Column

Care

Conditioning
Rinse the column with hydroxide eluent for 90 min at a maximum flow of 0.5 mL/min.

Regeneration
Rinse the column with the following solutions in succession in the direction against the flow:

- during 30 min with 0.1 mol/L hydrochloric acid at a flow rate of 0.3 mL/min
- during 30 min with 1 mol/L sodium chloride solution at a flow rate of 0.3 mL/min
- during 30 min with ultrapure water at a flow rate of 0.5 mL/min
- during 90 min with hydroxide eluent at a flow rate of maximum 0.5 mL/min

Storage
in ultrapure water

Ordering information

Metrosep BO_3^{3-} Trap 1 - 100/4.0	6.1015.200

Metrosep CO_3^{2-} Trap 1 - 100/4.0 (6.1015.300)

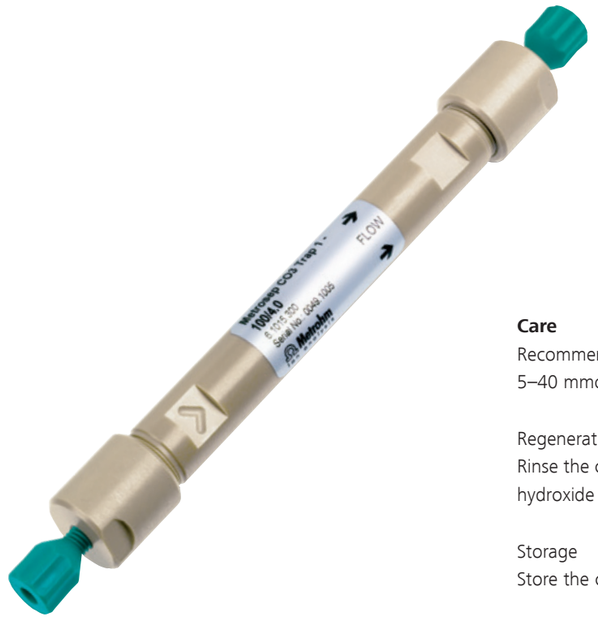
Trap column for the removal of carbonate traces in hydroxide eluents. The Metrosep CO_3^{2-} Trap 1 - 100/4.0 is used in carbohydrate analysis with hydroxide eluents.

Applications

- Elimination of carbonate contamination from hydroxide eluents

Technical information

Substrate	Poly(styrene-co-divinylbenzene)
Column dimensions	100 x 4.0 mm
Column body	PEEK
Maximum pressure	25 MPa
pH range	0–14
Type	Column



Care

Recommended eluent concentration
5–40 mmol/L hydroxide eluent

Regeneration
Rinse the column during 840 min with 0.3 mol/L sodium hydroxide at a flow rate of 1 mL/min.

Storage
Store the column in 0.3 mol/L sodium hydroxide.

Ordering information

Metrosep CO_3^{2-} Trap 1 - 100/4.0	6.1015.300

IC sample-preparation cartridges

IC-RP sample-preparation cartridge (6.1012.X00)		
Material	RP	
Application	For the non-polar solid-phase extraction. The cartridge removes organic substances.	
Quantity	50	10
Bed volume	0.5 mL	0.5 mL
Connection	Luer	Luer
Order number	6.1012.000	6.1012.100

IC-H sample-preparation cartridge (6.1012.X10)			
Material	Cation exchanger in acid form		
Application	For the elimination of interfering cations. The cartridge can also be used for the neutralization of alkaline samples.		
Quantity	50	10	25
Bed volume	0.5 mL	0.5 mL	1.5 mL
Capacity	0.8 mmol	0.8 mmol	2.0 mmol
Connection	Luer	Luer	Luer
Order number	6.1012.010	6.1012.110	6.1012.210

IC-Ag sample-preparation cartridge (6.1012.X20)			
Material	Cation exchanger in silver form		
Application	For the removal of halides.		
Quantity	50	10	25
Bed volume	0.5 mL	0.5 mL	1.5 mL
Capacity	0.8 mmol	0.8 mmol	2.0 mmol
Connection	Luer	Luer	Luer
Order number	6.1012.020	6.1012.120	6.1012.220

IC-OH sample-preparation cartridge (6.1012.X30)		
Material	Anion exchanger in hydroxide form	
Application	For the neutralization of extremely acidic samples.	
Quantity	50	10
Bed volume	0.5 mL	0.5 mL
Capacity	0.6 mmol	0.6 mmol
Connection	Luer	Luer
Order number	6.1012.030	6.1012.130

IC-Na sample-preparation cartridge (6.1012.X40)	
Material	Cation exchanger in sodium form
Application	For the elimination of cations.
Quantity	50
Bed volume	0.5 mL
Capacity	0.8 mmol
Connection	Luer
Order number	6.1012.040

IC-C18 sample-preparation cartridge (6.1012.X50)	
Material	C18
Application	For the removal of polar substances; not suitable for F^- determination.
Quantity	50
Bed volume	0.5 mL
Connection	Luer
Order number	6.1012.050

PEEK inline filter (6.2821.120)

The inline filter in the PEEK housing not only removes all particles of mineral origin, but also algae and bacteria. The exclusion diameter of 2 µm ensures that no contamination can damage the column or the suppressor.

Ordering information	
PEEK inline filter	6.2821.120
Replacement filters (10 pcs.)	6.2821.130

Coupling safety olive with PEEK inline filter (6.2744.180)

The coupling safety olive with PEEK inline filter connects the tube of the peristaltic pump with the following system, e.g. with the suppressor or with the post-column reactor (PCR). On the one hand, this prevents the tube of the peristaltic pump from detaching unintentionally, while on the other hand all particles with a diameter of greater than 2 µm are effectively removed from the flow of liquid.

Ordering information	
Coupling safety olive with PEEK inline filter	6.2744.180
Replacement filters (10 pcs.)	6.2821.130

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