

Ion Exclusion Chromatography Columns

Features

SH1011 SH1821

- Columns for simultaneous analysis of saccharides and organic acids (counter ion: H⁺)
- Separates neutral sugars by size exclusion mode and organic acids by ion exclusion mode
- Suitable for the analysis of uronic and aldonic acids
- Fulfill USP-NF L17 and L22 requirements

KC-811

- Columns suitable for the analysis of organic acids
- Separates compounds by ion exclusion mode and reversed phase mode
- Highly selective when used with post column method
- KC-811 6E is suitable for cyanide ions and cyanogen chloride analysis in accordance with the Japanese Water Supply Act
- Fulfills USP-NF L17 and L22 requirements

For simultaneous analysis of saccharides and organic acids

• Standard columns

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Exclusion Limit (Pullulan)	Particle Size (μm)	Column Size (mm) I.D. x Length	Shipping Solvent
F6378100	SUGAR SH1011	≥ 17,000	Sulfo	1,000	6	8.0 x 300	H ₂ O
F6378101	SUGAR SH1821	≥ 17,000	Sulfo	10,000	6	8.0 x 300	H ₂ O
F6700080	SUGAR SH-G	(guard column)	Sulfo	—	10	6.0 x 50	H ₂ O
F6378104	SUGAR SH1011 8C	≥ 5,000	Sulfo	1,000	6	8.0 x 100	H ₂ O

Base Material: Styrene divinylbenzene copolymer

For organic acids, cyanide ions and cyanogen chloride

• Standard columns

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (μm)	Column Size (mm) I.D. x Length	Shipping Solvent
F6378030	RSpak KC-811	≥ 17,000	Sulfo	6	8.0 x 300	0.1 % H ₃ PO ₄ aq.
F6378033	RSpak KC-811 6E	≥ 13,000	Sulfo	6	6.0 x 250	0.1 % H ₃ PO ₄ aq.
F6700030	RSpak KC-G 6B	(guard column)	Sulfo	10	6.0 x 50	0.1 % H ₃ PO ₄ aq.
F6700010	RSpak KC-G 8B	(guard column)	Sulfo	13	8.0 x 50	0.1 % H ₃ PO ₄ aq.

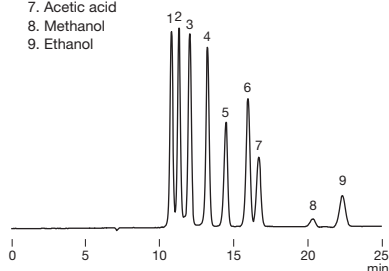
Use KC-G 8B for samples with relatively high impurities and KC-G 6B for samples with relatively low impurities.

Base Material: Styrene divinylbenzene copolymer

Maltooligosaccharides, organic acids and ethanol

Sample : 0.05 % each, 20 μ L

1. Maltotetraose
2. Maltotriose
3. Maltose
4. Glucose
5. Lactic acid
6. Glycerin
7. Acetic acid
8. Methanol
9. Ethanol

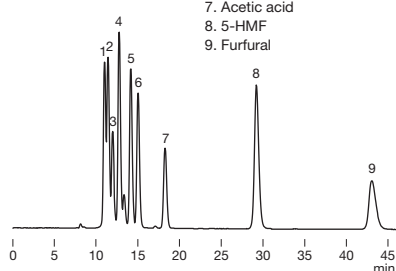


Column : Shodex SUGAR SH1821
Eluent : 0.5 mM H₂SO₄ aq.
Flow rate : 0.6 mL/min
Detector : RI
Column temp. : 75 °C

Cello-oligosaccharides and furfurals

Sample : 0.1 % each, 10 μ L

1. Cellopentaose
2. Cellotetraose
3. Cellotriose
4. Cellobiose
5. Glucose
6. Glyceric acid
7. Acetic acid
8. 5-HMF
9. Furfural

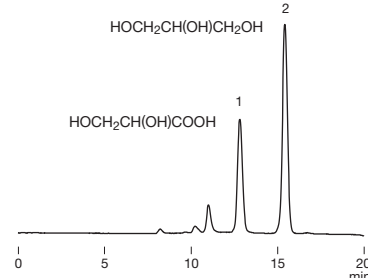


Column : Shodex SUGAR SH1821
Eluent : 2 mM H₂SO₄ aq.
Flow rate : 0.6 mL/min
Detector : RI
Column temp. : 60 °C

Glycerin and glyceric acid

Sample : 0.1 % each, 10 μ L

1. Glyceric acid
2. Glycerin



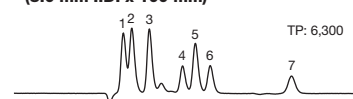
Column : Shodex SUGAR SH1011
Eluent : 2 mM H₂SO₄ aq.
Flow rate : 0.6 mL/min
Detector : RI
Column temp. : 60 °C

Rapid analysis of maltooligosaccharides, organic acids and ethanol

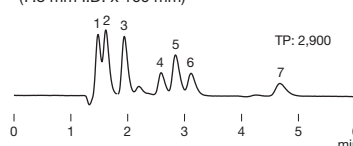
Sample : 0.1 % each, 5 μ L

1. Maltotriose
2. Maltose
3. Glucose
4. Lactic acid
5. Acetic acid
6. Glycerin
7. Ethanol

(1) Shodex SUGAR SH1011 8C (8.0 mm I.D. x 100 mm)



(2) Ion exclusion column from other manufacturer (7.8 mm I.D. x 100 mm)

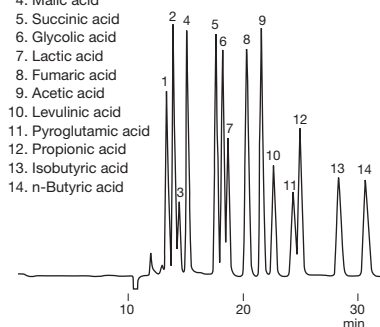


Column : (1) Shodex SUGAR SH1011 8C
(2) Ion exclusion column from other manufacturer
Eluent : 1 mM H₂SO₄ aq.
Flow rate : (1) 1.0 mL/min
(2) 0.95 mL/min
Detector : RI
Column temp. : 65 °C

Common organic acids

Sample :

1. Citric acid
2. Tartaric acid
3. Pyruvic acid
4. Malic acid
5. Succinic acid
6. Glycolic acid
7. Lactic acid
8. Fumaric acid
9. Acetic acid
10. Levulinic acid
11. Pyroglutamic acid
12. Propionic acid
13. Isobutyric acid
14. n-Butyric acid

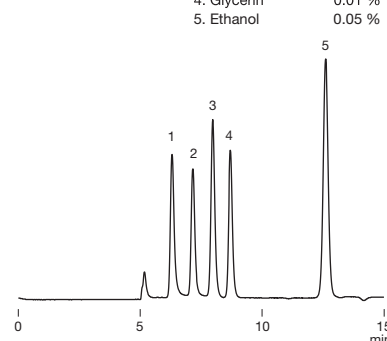


Column : Shodex RSpak KC-811 x 2
Eluent : 6 mM HClO₄ aq.
Flow rate : 1.0 mL/min
Detector : VIS (430 nm)
post column method
Column temp. : 50 °C

Glucuronolactone and organic acids

Sample : 20 μ L

1. Citric acid 0.01 %
2. Malic acid 0.01 %
3. Glucuronolactone 0.01 %
4. Glycerin 0.01 %
5. Ethanol 0.05 %

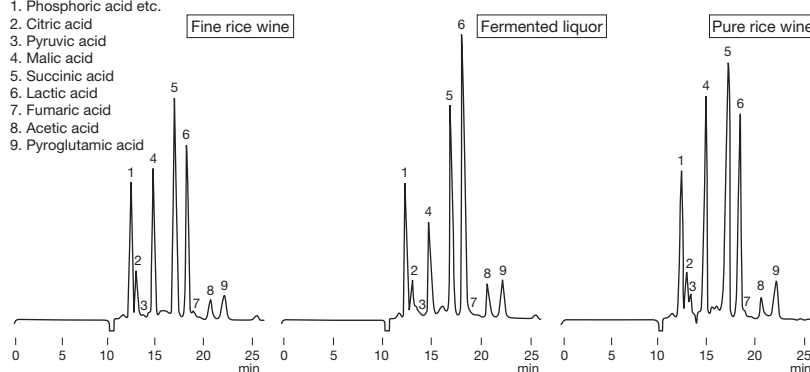


Column : Shodex RSpak KC-811
Eluent : 3 mM HClO₄ aq.
Flow rate : 1.0 mL/min
Detector : RI
Column temp. : 40 °C

Organic acids in sake

Sample : 100 μ L

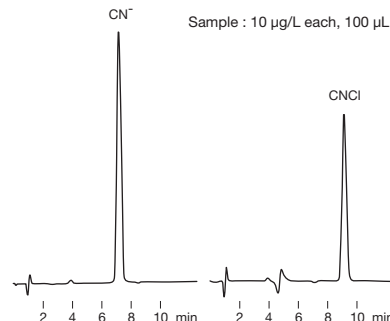
1. Phosphoric acid etc.
2. Citric acid
3. Pyruvic acid
4. Malic acid
5. Succinic acid
6. Lactic acid
7. Fumaric acid
8. Acetic acid
9. Pyroglutamic acid



Column : Shodex RSpak KC-G 8B + KC-811 x 2
Eluent : 4.8 mM HClO₄ aq.
Flow rate : 1.0 mL/min
Detector : VIS (430 nm)
post column method
Column temp. : 63 °C

Analysis of cyanide ion and cyanogen chloride with post column method

Sample : 10 μ g/L each, 100 μ L



Column : Shodex RSpak KC-811 6E
Eluent : 1 mM H₂SO₄ aq.
Reagent A : Chloramine T solution
Reagent B : 4-Pyridinecarboxylic acid-Pyrazolone solution
Flow rate : (Eluent) 1.0 mL/min
(Reagent) 0.5 mL/min each
Detector : VIS (638 nm)
Column temp. : 40 °C
Reaction temp. : (Reagent A) 40 °C
(Reagent B) 80 °C

Ion Chromatography Columns (Anion Analysis)

Features

NI-424 I-524A

- Ideal for anion non-suppressor methods
- NI-424 provides simultaneous analysis of fluoride and phosphate ions
- I-524A fulfills USP-NF L23 requirements

SI-90 4E SI-50 4E SI-52 4E

- Suitable for anion suppressor methods with sodium carbonate eluent
- Suitable for the quantitative analysis of fluoride ion
- Carbonate peak does not interfere with analysis
- SI-50 4E separates target inorganic anions from organic acids
- SI-52 4E provides simultaneous analysis of oxyhalides and general inorganic ions

SI-35

- Rapid-analysis type columns used with suppressor and sodium carbonate eluent
- SI-35 4D provides rapid analysis of oxyhalides and general inorganic ions
- SI-35 2B provides rapid analysis of general inorganic ions

SI-36 4D SI-37 4D

- Suitable for anion suppressor methods with potassium hydroxide eluent
- SI-36 4D provides good separation of sulfite and sulfate ions
- SI-37 4D provides high sensitive analysis of oxyhalides in drinking water

For non-suppressor method

• Standard columns

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (μm)	Column Size (mm) I.D. x Length	Shipping Solvent
F6995243	IC NI-424	≥ 5,000	Quaternary ammonium	5	4.6 x 100	8 mM 4-Hydroxybenzoic acid + 2.8 mM Bis-Tris + 2 mM Phenylboronic acid + 0.005 mM CyDTA aq.
F6709616	IC NI-G	(guard column)	Quaternary ammonium	5	4.6 x 10	8 mM 4-Hydroxybenzoic acid + 2.8 mM Bis-Tris + 2 mM Phenylboronic acid + 0.005 mM CyDTA aq.
F6995240	IC I-524A	≥ 2,000	Quaternary ammonium	12	4.6 x 100	2.5 mM Phthalic acid + 2.4 mM Tris(hydroxymethyl) aminomethane + 16.2 mM Boric acid aq.
F6700400	IC IA-G	(guard column)	Quaternary ammonium	12	4.6 x 10	2.5 mM Phthalic acid + 2.4 mM Tris(hydroxymethyl) aminomethane + 16.2 mM Boric acid aq.

Base Material: Polyhydroxymethacrylate
Housing Material: SUS

For suppressor method (Sodium carbonate eluent)

• Standard columns

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (μm)	Column Size (mm) I.D. x Length	Shipping Solvent
F6995244	IC SI-90 4E	≥ 5,000	Quaternary ammonium	9	4.0 x 250	1.8 mM Na ₂ CO ₃ + 1.7 mM NaHCO ₃ aq.
F6709620	IC SI-90G	(guard column)	Quaternary ammonium	9	4.6 x 10	1.8 mM Na ₂ CO ₃ + 1.7 mM NaHCO ₃ aq.
F6995245	IC SI-50 4E	≥ 10,000	Quaternary ammonium	5	4.0 x 250	3.2 mM Na ₂ CO ₃ + 1.0 mM NaHCO ₃ aq.
F6709625	IC SI-50G	(guard column)	Quaternary ammonium	5	4.6 x 10	3.2 mM Na ₂ CO ₃ + 1.0 mM NaHCO ₃ aq.

Base Material: Polyvinyl alcohol
Housing Material: PEEK

<For oxyhalides analysis>

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (μm)	Column Size (mm) I.D. x Length	Shipping Solvent
F6995260	IC SI-52 4E	≥ 14,000	Quaternary ammonium	5	4.0 x 250	3.6 mM Na ₂ CO ₃ aq.
F6709626	IC SI-92G	(guard column)	Quaternary ammonium	5	4.6 x 10	3.6 mM Na ₂ CO ₃ aq.

Base Material: Polyvinyl alcohol
Housing Material: PEEK

<For oxyhalides rapid analysis>

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (μm)	Column Size (mm) I.D. x Length	Shipping Solvent
F6995290	IC SI-35 4D	≥ 13,000	Quaternary ammonium	3.5	4.0 x 150	3.6 mM Na ₂ CO ₃ aq.
F6709627	IC SI-95G	(guard column)	Quaternary ammonium	9	4.6 x 10	3.6 mM Na ₂ CO ₃ aq.

Base Material: Polyvinyl alcohol
Housing Material: PEEK

● Semi-micro column

<For rapid analysis>

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (μm)	Column Size (mm) I.D. x Length	Shipping Solvent
F6995291	IC SI-35 2B	≥ 4,000	Quaternary ammonium	3.5	2.0 x 50	1.0 mM Na ₂ CO ₃ + 2.0 mM NaHCO ₃ aq.

Base Material: Polyvinyl alcohol
Housing Material: PEEK

● Guard filter for IC SI-35 2B

Product Code	Product Name	Contents
F6709720	IC SI-2GF	One holder and one filter
F6709730	IC SI-2GF filter	3 filters

Removes sample-origin insoluble components.

For anion suppressor method (Potassium hydroxide eluent)

● Standard columns

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (μm)	Column Size (mm) I.D. x Length	Shipping Solvent
F6999361	IC SI-36 4D	≥ 8,500	Quaternary ammonium	3.5	4.0 x 150	10 mM Na ₂ SO ₄ aq.
F6999371	IC SI-37 4D	≥ 14,000	Quaternary ammonium	3.5	4.0 x 150	10 mM Na ₂ SO ₄ aq.
F6709620	IC SI-90G	(guard column)	Quaternary ammonium	9	4.6 x 10	1.8 mM Na ₂ CO ₃ + 1.7 mM NaHCO ₃ aq.

Base Material: Polyvinyl alcohol
Housing Material: PEEK

Ion Chromatography Columns (Cation Analysis)

Features

YS-50

- High performance type of YK-421
- Applicable to both suppressor and non-suppressor methods
- Provides sharp peaks; more significant for divalent cation analysis
- Supports the analysis of alkylamines and transition metals
- Fulfills USP-NF L125 requirements

YK-421

- Column for cation analysis with non-suppressor method
- Simultaneous analysis of monovalent and divalent cations
- Suitable separating alkylamines
- Fulfills USP-NF L76 requirements

For non-suppressor method/suppressor method

● Standard columns

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (μm)	Column Size (mm) I.D. x Length	Shipping Solvent
F7122000	IC YS-50	≥ 5,500	Carboxyl	5	4.6 x 125	10 mM Na ₂ SO ₄ aq.
F6700530	IC YS-G	(guard column)	Carboxyl	5	4.6 x 10	10 mM Na ₂ SO ₄ aq.

Base Material: Polyvinyl alcohol
Housing Material: SUS

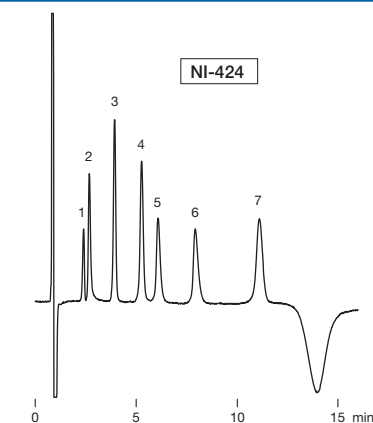
For non-suppressor method

● Standard columns

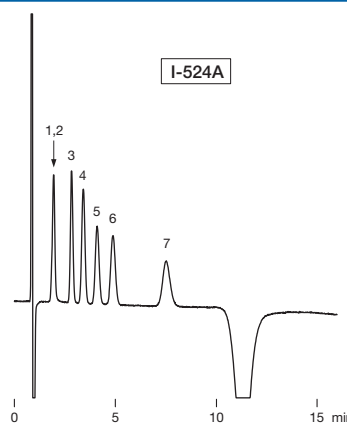
Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (μm)	Column Size (mm) I.D. x Length	Shipping Solvent
F7120012	IC YK-421	≥ 2,800	Carboxyl	5	4.6 x 125	5 mM Tartaric acid + 1 mM Dipicolinic acid + 24 mM Boric acid aq.
F6709608	IC YK-G	(guard column)	Carboxyl	5	4.6 x 10	5 mM Tartaric acid + 1 mM Dipicolinic acid + 24 mM Boric acid aq.

Base Material: Silica
Housing Material: SUS

Anion analysis using NI-424 and I-524A (non-suppressor methods)



Sample : 20 µL
 1. H₂PO₄⁻ 10 mg/L
 2. F⁻ 1 mg/L
 3. Cl⁻ 1 mg/L
 4. NO₂⁻ 5 mg/L
 5. Br⁻ 5 mg/L
 6. NO₃⁻ 5 mg/L
 7. SO₄²⁻ 5 mg/L



With twice increased theoretical plate number, NI-424 provides a higher performance compared to I-524A.

<Features of NI-424>

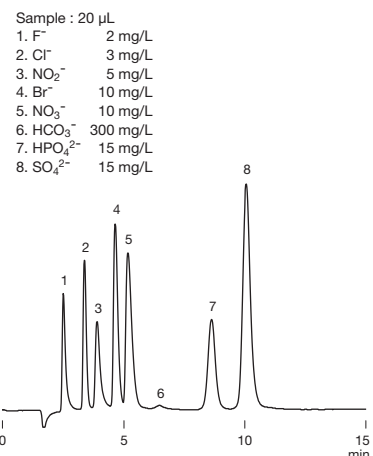
- (1) Enables the separation of H₂PO₄⁻ and F⁻ which were difficult to separate with I-524A.
- (2) Provides sharper peaks, and resolution between all peaks are well defined. Especially, the separation of Cl⁻ and NO₂⁻ is improved.

Column : Shodex IC NI-424
Eluent : 8 mM 4-Hydroxybenzoic acid + 2.8 mM Bis-Tris + 2 mM Phenylboronic acid + 0.005 mM *CyDTA aq.
Flow rate : 1.0 mL/min
Detector : Non-suppressed conductivity
Column temp. : 40 °C

*CyDTA : trans-1,2-Diaminocyclohexane-N,N,N',N'-tetra acetic acid

Column : Shodex IC I-524A
Eluent : 2.5 mM Phthalic acid + 2.3 mM Tris(hydroxymethyl)aminomethane aq.
Flow rate : 1.2 mL/min
Detector : Non-suppressed conductivity
Column temp. : 40 °C

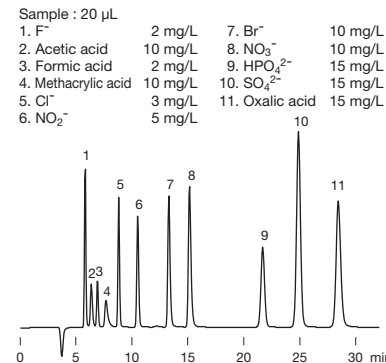
Anion analysis using SI-90 4E (suppressor method)



Column : Shodex IC SI-90 4E
Eluent : 1.8 mM Na₂CO₃ + 1.7 mM NaHCO₃ aq.
Flow rate : 1.5 mL/min
Detector : Suppressed conductivity
Column temp. : Room temp. (25 °C)

Anion analysis using SI-50 4E (suppressor method)

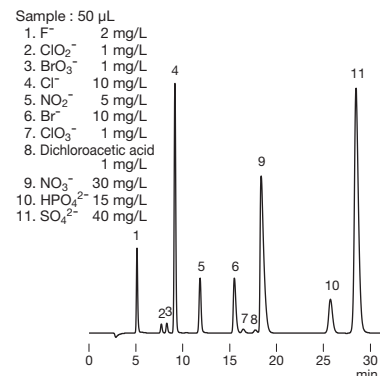
SI-50 4E is a high performance type of SI-90 4E. Acetic acid, formic acid, and methacrylic acid elute between F⁻ and Cl⁻. The carbonate system peak appears between NO₂⁻ and Br⁻ peaks.



Column : Shodex IC SI-50 4E
Eluent : 3.2 mM Na₂CO₃ + 1.0 mM NaHCO₃ aq.
Flow rate : 0.7 mL/min
Detector : Suppressed conductivity
Column temp. : 25 °C

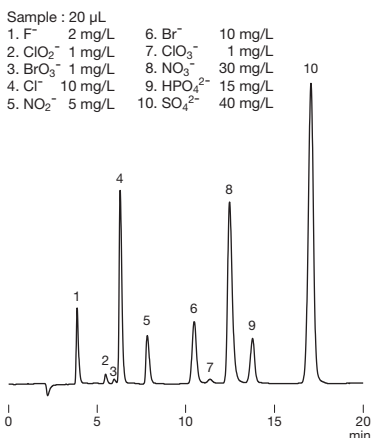
Oxyhalides and anions analysis using SI-52 4E (suppressor method)

SI-52 4E is a high resolution column offering 14,000 or higher theoretical plate number. It supports simultaneous analysis of oxyhalides and inorganic anions. It is recommended to set the column temperature at 45 °C.



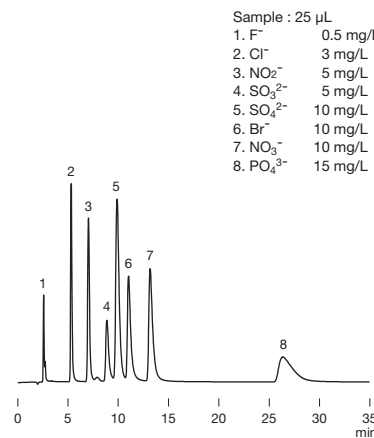
Column : Shodex IC SI-52 4E
Eluent : 3.6 mM Na₂CO₃ aq.
Flow rate : 0.8 mL/min
Detector : Suppressed conductivity
Column temp. : 45 °C

Rapid analysis of oxyhalides and anions using SI-35 4D (suppressor method)



Column : Shodex IC SI-35 4D
Eluent : 2.0 mM Na₂CO₃ + 4.5 mM NaHCO₃ aq.
Flow rate : 0.6 mL/min
Detector : Suppressed conductivity
Column temp. : 45 °C

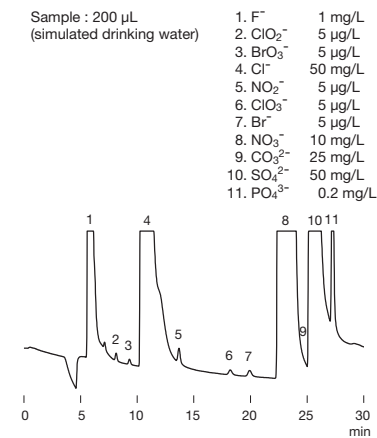
Anions and sulfite ion analysis using SI-36 4D (suppressor method)



Column : Shodex IC SI-36 4D
Eluent : 25 mM KOH aq.
Flow rate : 0.7 mL/min
Detector : Suppressed conductivity
Column temp. : 30 °C

Eluent source : Dionex EGC 500 KOH

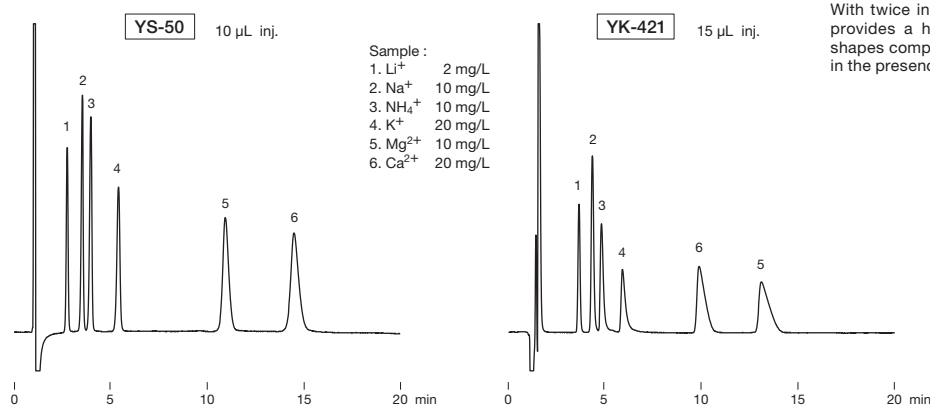
Analysis of Oxyhalides in Artificial-Drinking Water According to EPA Method 300.1 (suppressor method)



Column : Shodex IC SI-37 4D
Eluent : (Gradient) KOH aq.
 10 mM (0 to 21 min), 45 mM (21.01 to 40 min)
Flow rate : 0.5 mL/min
Detector : Suppressed conductivity
Column temp. : 30 °C

Eluent source : Dionex EGC 500 KOH

Cation analysis using YS-50 and YK-421



With twice increased theoretical plate number, YS-50 provides a higher performance with improved peak shapes compared to YK-421. The quantitation of NH₄⁺ in the presence of high Na⁺ content is also improved.

TP	YS-50	YK-421
Mg ²⁺	6,900	3,000
Ca ²⁺	6,600	3,000

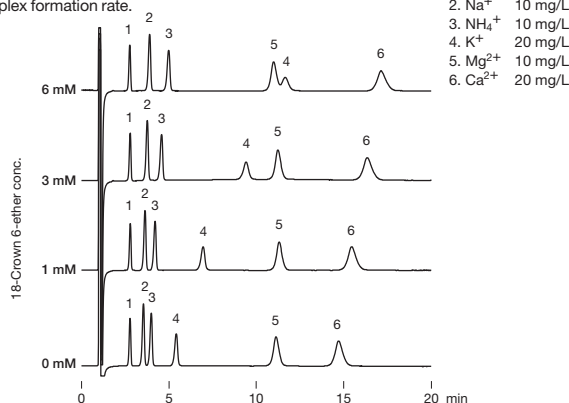
Resolution (Na ⁺ / NH ₄ ⁺)	YS-50	YK-421
	2.5	2.1

Column : Shodex IC YS-50
Eluent : 4 mM Methanesulfonic acid aq.
Flow rate : 1.0 mL/min
Detector : Non-suppressed conductivity
Column temp. : 40 °C

Column : Shodex IC YK-421
Eluent : 5 mM Tartaric acid + 1 mM Dipicolinic acid + 24 mM Boric acid aq.
Flow rate : 1.0 mL/min
Detector : Non-suppressed conductivity
Column temp. : 40 °C

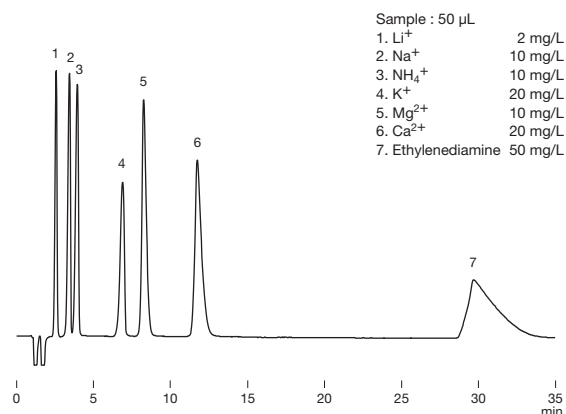
Effects of added crown ether in the eluent

The elution of cations (particularly K⁺) can be well controlled by modifying the eluent concentration, as it provides different complex formation rate.



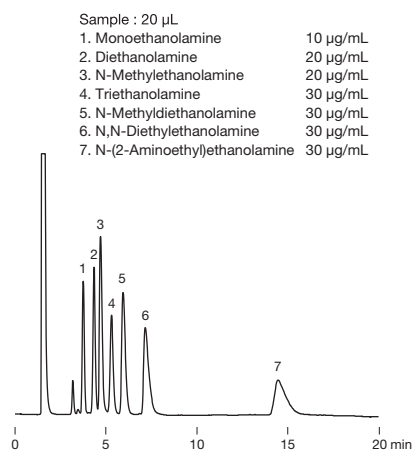
Column : Shodex IC YS-50
Eluent : 4 mM Methanesulfonic acid + 18-Crown 6-ether aq.
Flow rate : 1.0 mL/min
Detector : Non-suppressed conductivity
Column temp. : 40 °C

Simultaneous analysis of cations and ethylenediamine



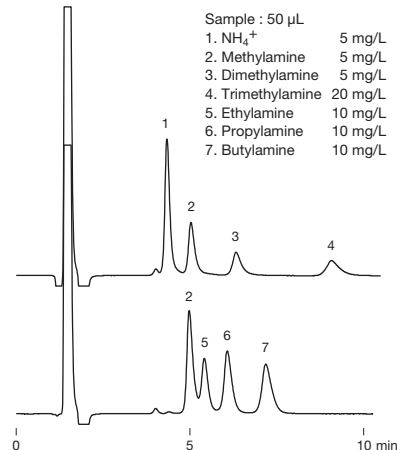
Column : Shodex IC YS-50
Eluent : 4 mM Nitric acid + 1.5 mM 18-Crown 6-ether aq.
 /CH₃CN = 90/10
Flow rate : 1.0 mL/min
Detector : Non-suppressed conductivity
Column temp. : 40 °C

Amino alcohols



Column : Shodex IC YK-421
Eluent : 4 mM Nitric acid aq.
Flow rate : 1.0 mL/min
Detector : Non-suppressed conductivity
Column temp. : 40 °C

Alkylamines



Column : Shodex IC YK-421
Eluent : 4 mM H₃PO₄ aq./CH₃CN = 90/10
Flow rate : 1.0 mL/min
Detector : Non-suppressed conductivity
Column temp. : 25 °C