

# Ion Chromatography Columns (Anion Analysis)

## Features

<b>NI-424</b> <b>I-524A</b>	<ul style="list-style-type: none"> <li>• Ideal for anion non-suppressor methods</li> <li>• NI-424 provides simultaneous analysis of fluoride and phosphate ions</li> </ul>
<b>SI-90 4E</b> <b>SI-50 4E</b> <b>SI-52 4E</b>	<ul style="list-style-type: none"> <li>• Suitable for anion suppressor methods with sodium carbonate eluent</li> <li>• Suitable for the quantitative analysis of fluoride ion</li> <li>• SI-50 4E separates target inorganic anions from organic acids</li> <li>• SI-52 4E provides simultaneous analysis of oxyhalides and general inorganic ions</li> <li>• Carbonate peak does not interfere with analysis</li> </ul>
<b>SI-35</b>	<ul style="list-style-type: none"> <li>• Columns for rapid analysis with suppressor method</li> <li>• SI-35 4D provides rapid analysis of oxyhalides and general inorganic ions</li> <li>• SI-35 2B provides rapid analysis of general inorganic ions</li> </ul>
<b>New</b> <b>SI-36 4D</b>	<ul style="list-style-type: none"> <li>• A column using potassium hydroxide as eluent for anion analysis with suppressor method</li> <li>• Good separation of sulfite ion / sulfate ion</li> <li>• Analysis of seven general inorganic anions within 30 minutes under isocratic conditions</li> </ul>

## For anion 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	<b>IC NI-424</b>	≥ 5,000	Quaternary ammonium	5	<b>4.6 x 100</b>	8 mM 4-Hydroxybenzoic acid + 2.8 mM Bis-Tris + 2 mM Phenylboronic acid + 0.005 mM CyDTA aq.
F6709616	<b>IC NI-G</b>	(guard column)	Quaternary ammonium	5	<b>4.6 x 10</b>	8 mM 4-Hydroxybenzoic acid + 2.8 mM Bis-Tris + 2 mM Phenylboronic acid + 0.005 mM CyDTA aq.
F6995240	<b>IC I-524A</b>	≥ 2,000	Quaternary ammonium	12	<b>4.6 x 100</b>	2.5 mM Phthalic acid aq.
F6700400	<b>IC IA-G</b>	(guard column)	Quaternary ammonium	12	<b>4.6 x 10</b>	2.5 mM Phthalic acid aq.

Base Material: Polyhydroxymethacrylate Housing Material: SUS

## For anion 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	<b>IC SI-90 4E</b>	≥ 5,000	Quaternary ammonium	9	<b>4.0 x 250</b>	1.8 mM Na <sub>2</sub> CO <sub>3</sub> + 1.7 mM NaHCO <sub>3</sub> aq.
F6709620	<b>IC SI-90G</b>	(guard column)	Quaternary ammonium	9	<b>4.6 x 10</b>	1.8 mM Na <sub>2</sub> CO <sub>3</sub> + 1.7 mM NaHCO <sub>3</sub> aq.
F6995245	<b>IC SI-50 4E</b>	≥ 10,000	Quaternary ammonium	5	<b>4.0 x 250</b>	3.2 mM Na <sub>2</sub> CO <sub>3</sub> + 1.0 mM NaHCO <sub>3</sub> aq.
F6709625	<b>IC SI-50G</b>	(guard column)	Quaternary ammonium	5	<b>4.6 x 10</b>	3.2 mM Na <sub>2</sub> CO <sub>3</sub> + 1.0 mM NaHCO <sub>3</sub> aq.

Base Material: Polyvinyl alcohol Housing Material: PEEK

### [ For oxyhalides suppressor method ]

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (µm)	Column Size (mm) I.D. x Length	Shipping Solvent
F6995260	<b>IC SI-52 4E</b>	≥ 14,000	Quaternary ammonium	5	<b>4.0 x 250</b>	3.6 mM Na <sub>2</sub> CO <sub>3</sub> aq.
F6709626	<b>IC SI-92G</b>	(guard column)	Quaternary ammonium	9	<b>4.6 x 10</b>	3.6 mM Na <sub>2</sub> CO <sub>3</sub> aq.

Base Material: Polyvinyl alcohol Housing Material: PEEK

### [ 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
F6995290	<b>IC SI-35 4D</b>	≥ 13,000	Quaternary ammonium	3.5	<b>4.0 x 150</b>	3.6 mM Na <sub>2</sub> CO <sub>3</sub> aq.
F6709627	<b>IC SI-95G</b>	(guard column)	Quaternary ammonium	9	<b>4.6 x 10</b>	3.6 mM Na <sub>2</sub> CO <sub>3</sub> aq.

Base Material: Polyvinyl alcohol Housing Material: PEEK

### ● Semi-micro columns

#### [ 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	<b>IC SI-35 2B</b>	≥ 4,000	Quaternary ammonium	3.5	<b>2.0 x 50</b>	1.0 mM Na <sub>2</sub> CO <sub>3</sub> + 2.0 mM NaHCO <sub>3</sub> aq.

Base Material: Polyvinyl alcohol Housing Material: PEEK

## 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	<b>New IC SI-36 4D</b>	≥ 8,500	Quaternary ammonium	3.5	<b>4.0 x 150</b>	25 mM KOH aq.

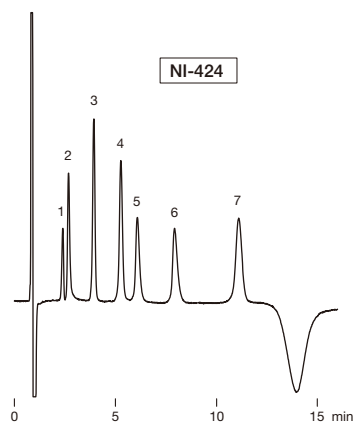
Base Material: Polyvinyl alcohol Housing Material: PEEK

### [ Guard filter for SI-35 2B ]

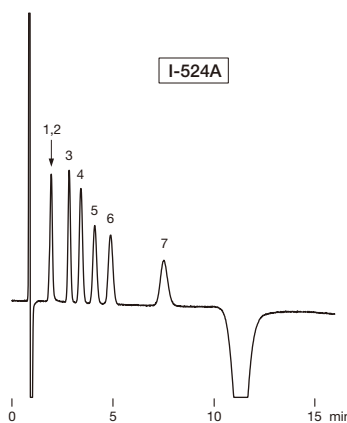
Product Code	Product Name	Contents
F6709720	<b>IC SI-2GF</b>	One holder and one filter
F6709730	<b>IC SI-2GF filter</b>	3 filters

Removes insoluble components in the sample

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



Sample : 20  $\mu$ L  
 1.  $\text{H}_2\text{PO}_4^-$  10 mg/L  
 2.  $\text{F}^-$  1 mg/L  
 3.  $\text{Cl}^-$  1 mg/L  
 4.  $\text{NO}_2^-$  5 mg/L  
 5.  $\text{Br}^-$  5 mg/L  
 6.  $\text{NO}_3^-$  5 mg/L  
 7.  $\text{SO}_4^{2-}$  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  $\text{H}_2\text{PO}_4^-$  and  $\text{F}^-$  which were difficult to separate with I-524A.  
 (2) Provides sharper peaks, and resolution between all peaks are well defined. Especially, the separation of  $\text{Cl}^-$  and  $\text{NO}_2^-$  is improved.

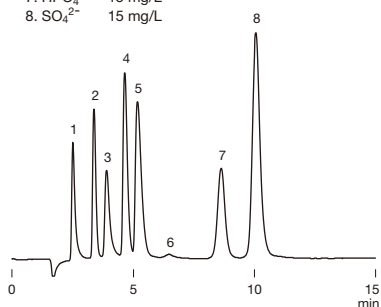
**Column** : Shodex IC NI-424  
**Eluent** : 8 mM 4-Hydroxybenzoic acid + 2.8 mM Bis-Tris + 2 mM Phenylboronic acid + 0.005 mM  $\text{^*CyDTA}$  aq.  
**Flow rate** : 1.0 mL/min  
**Detector** : Non-suppressed conductivity  
**Column temp.** : 40  $^\circ\text{C}$

**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  $^\circ\text{C}$

$\text{^*CyDTA}$  : trans-1,2-Diaminocyclohexane-N,N,N',N'-tetra acetic acid

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

Sample : 20  $\mu$ L  
 1.  $\text{F}^-$  2 mg/L  
 2.  $\text{Cl}^-$  3 mg/L  
 3.  $\text{NO}_2^-$  5 mg/L  
 4.  $\text{Br}^-$  10 mg/L  
 5.  $\text{NO}_3^-$  10 mg/L  
 6.  $\text{HCO}_3^-$  300 mg/L  
 7.  $\text{HPO}_4^{2-}$  15 mg/L  
 8.  $\text{SO}_4^{2-}$  15 mg/L

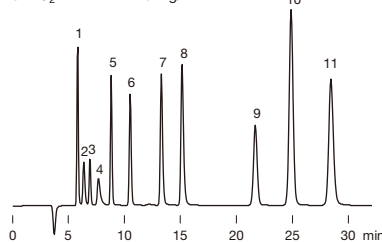


**Column** : Shodex IC SI-90 4E  
**Eluent** : 1.8 mM  $\text{Na}_2\text{CO}_3$  + 1.7 mM  $\text{NaHCO}_3$  aq.  
**Flow rate** : 1.5 mL/min  
**Detector** : Suppressed conductivity  
**Column temp.** : Room temp. (25  $^\circ\text{C}$ )

### 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 eluted between  $\text{F}^-$  and  $\text{Cl}^-$ . The carbonate system peak appears between  $\text{NO}_2^-$  and  $\text{Br}^-$  peaks.

Sample : 20  $\mu$ L  
 1.  $\text{F}^-$  2 mg/L  
 2. Acetic acid 10 mg/L  
 3. Formic acid 2 mg/L  
 4. Methacrylic acid 10 mg/L  
 5.  $\text{Cl}^-$  3 mg/L  
 6.  $\text{NO}_2^-$  5 mg/L  
 7.  $\text{Br}^-$  10 mg/L  
 8.  $\text{NO}_3^-$  10 mg/L  
 9.  $\text{HPO}_4^{2-}$  15 mg/L  
 10.  $\text{SO}_4^{2-}$  15 mg/L  
 11. Oxalic acid 15 mg/L

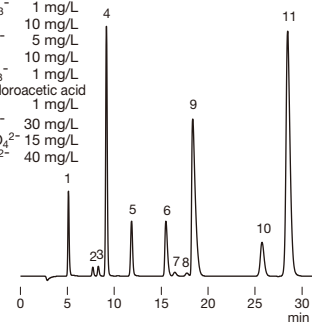


**Column** : Shodex IC SI-50 4E  
**Eluent** : 3.2 mM  $\text{Na}_2\text{CO}_3$  + 1.0 mM  $\text{NaHCO}_3$  aq.  
**Flow rate** : 0.7 mL/min  
**Detector** : Suppressed conductivity  
**Column temp.** : 25  $^\circ\text{C}$

### 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  $^\circ\text{C}$ .

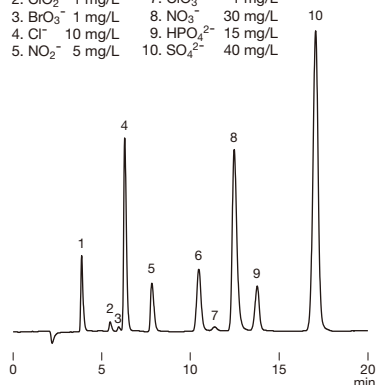
Sample : 50  $\mu$ L  
 1.  $\text{F}^-$  2 mg/L  
 2.  $\text{ClO}_2^-$  1 mg/L  
 3.  $\text{BrO}_3^-$  1 mg/L  
 4.  $\text{Cl}^-$  10 mg/L  
 5.  $\text{NO}_2^-$  5 mg/L  
 6.  $\text{Br}^-$  10 mg/L  
 7.  $\text{ClO}_3^-$  1 mg/L  
 8. Dichloroacetic acid 1 mg/L  
 9.  $\text{NO}_3^-$  30 mg/L  
 10.  $\text{HPO}_4^{2-}$  15 mg/L  
 11.  $\text{SO}_4^{2-}$  40 mg/L



**Column** : Shodex IC SI-52 4E  
**Eluent** : 3.6 mM  $\text{Na}_2\text{CO}_3$  aq.  
**Flow rate** : 0.8 mL/min  
**Detector** : Suppressed conductivity  
**Column temp.** : 45  $^\circ\text{C}$

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

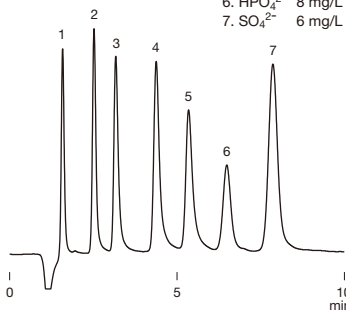
Sample : 20  $\mu$ L  
 1.  $\text{F}^-$  2 mg/L  
 2.  $\text{ClO}_2^-$  1 mg/L  
 3.  $\text{BrO}_3^-$  1 mg/L  
 4.  $\text{Cl}^-$  10 mg/L  
 5.  $\text{NO}_2^-$  5 mg/L  
 6.  $\text{Br}^-$  10 mg/L  
 7.  $\text{ClO}_3^-$  1 mg/L  
 8.  $\text{NO}_3^-$  30 mg/L  
 9.  $\text{HPO}_4^{2-}$  15 mg/L  
 10.  $\text{SO}_4^{2-}$  40 mg/L



**Column** : Shodex IC SI-35 4D  
**Eluent** : 2.0 mM  $\text{Na}_2\text{CO}_3$  + 4.5 mM  $\text{NaHCO}_3$  aq.  
**Flow rate** : 0.6 mL/min  
**Detector** : Suppressed conductivity  
**Column temp.** : 45  $^\circ\text{C}$

### Rapid analysis of anions using SI-35 2B (suppressor method)

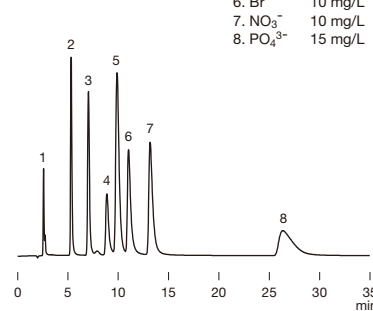
Sample : 2  $\mu$ L  
 1.  $\text{F}^-$  1 mg/L  
 2.  $\text{Cl}^-$  2 mg/L  
 3.  $\text{NO}_2^-$  3 mg/L  
 4.  $\text{Br}^-$  5 mg/L  
 5.  $\text{NO}_3^-$  5 mg/L  
 6.  $\text{HPO}_4^{2-}$  8 mg/L  
 7.  $\text{SO}_4^{2-}$  6 mg/L



**Column** : Shodex IC SI-35 2B  
**Eluent** : 1.0 mM  $\text{Na}_2\text{CO}_3$  + 2.0 mM  $\text{NaHCO}_3$  aq.  
**Flow rate** : 0.2 mL/min  
**Detector** : Suppressed conductivity  
**Column temp.** : 30  $^\circ\text{C}$

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

Sample : 25  $\mu$ L  
 1.  $\text{F}^-$  0.5 mg/L  
 2.  $\text{Cl}^-$  3 mg/L  
 3.  $\text{NO}_2^-$  5 mg/L  
 4.  $\text{SO}_3^{2-}$  5 mg/L  
 5.  $\text{SO}_4^{2-}$  10 mg/L  
 6.  $\text{Br}^-$  10 mg/L  
 7.  $\text{NO}_3^-$  10 mg/L  
 8.  $\text{PO}_4^{3-}$  15 mg/L



**Column** : Shodex IC SI-36 4D  
**Eluent** : 25 mM  $\text{KOH}$  aq.  
**Flow rate** : 0.7 mL/min  
**Detector** : Suppressed conductivity  
**Column temp.** : 30  $^\circ\text{C}$

Eluent source : Dionex<sup>TM</sup> EGC 500  $\text{KOH}$

# 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
- 
- YK-421**
- Column for cation analysis with non-suppressor method
  - Simultaneous analysis of monovalent and divalent cations
  - Suitable separating of alkylamines
  - Fulfills USP L76 requirements
- 
- Y-521**
- Column for cation analysis with non-suppressor method
  - Separates monovalent cations or divalent cations
  - Fulfills USP L17 and L22 requirements
- 
- T-521**
- Column for transition metal ion analysis
  - Highly sensitive analysis achievable using post column color reaction method
  - Fulfills USP L17 and L22 requirements

## ● Standard columns

### [ For cations ]

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Base Material	Particle Size (µm)	Column Size (mm) I.D. x Length	Shipping Solvent
F7122000	<b>IC YS-50</b>	≥ 5,500	Carboxyl	Polyvinyl alcohol	5	<b>4.6 × 125</b>	H <sub>2</sub> O
F6700530	<b>IC YS-G</b>	(guard column)	Carboxyl	Polyvinyl alcohol	5	<b>4.6 × 10</b>	H <sub>2</sub> O
F7120012	<b>IC YK-421</b>	≥ 2,800	Carboxyl	Silica	5	<b>4.6 × 125</b>	5 mM Tartaric acid + 1 mM Dipicolinic acid + 1.5 g/L Boric acid aq.
F6709608	<b>IC YK-G</b>	(guard column)	Carboxyl	Silica	5	<b>4.6 × 10</b>	5 mM Tartaric acid + 1 mM Dipicolinic acid + 1.5 g/L Boric acid aq.
F6995210	<b>IC Y-521</b>	≥ 3,000	Sulfo	Styrene divinylbenzene copolymer	12	<b>4.6 × 150</b>	4 mM HNO <sub>3</sub> aq.
F6700230	<b>IC Y-G</b>	(guard column)	Sulfo	Styrene divinylbenzene copolymer	12	<b>4.6 × 10</b>	4 mM HNO <sub>3</sub> aq.

Housing Material: SUS

## ● Standard columns

### [ For transition metal ions ]

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (µm)	Column Size (mm) I.D. x Length	Shipping Solvent
F6995250	<b>IC T-521</b>	≥ 3,000	Sulfo	12	<b>4.6 × 150</b>	3 mM HNO <sub>3</sub> aq.
F6700412	<b>IC T-G</b>	(guard column)	Sulfo	12	<b>4.6 × 10</b>	3 mM HNO <sub>3</sub> aq.

Base Material: Styrene divinylbenzene copolymer Housing Material: PEEK

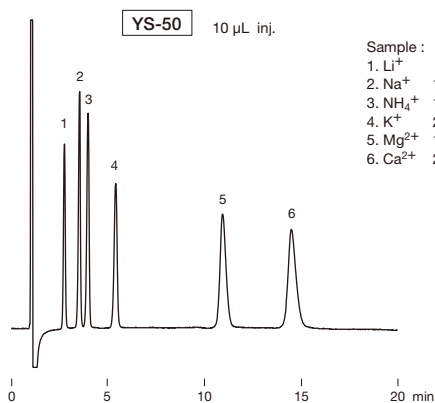
## ● Line filters for IC

### [ Shareable for anion analysis and cation analysis ]

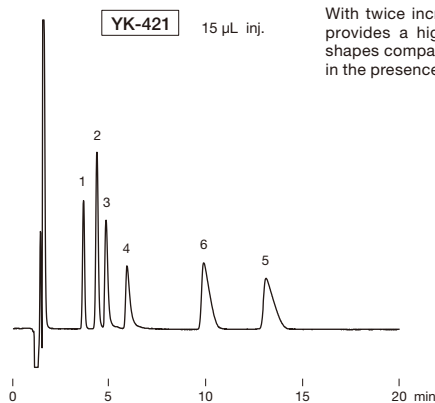
Product Code	Product Name	Contents
F8500630	<b>IC FL-1</b>	One holder and one filter
F8500640	<b>IC FL-1 filter</b>	5 filters

Removes insoluble components in the eluent by installing it upstream of the injector

### Cation analysis using YS-50 and YK-421



Sample :  
 1. Li<sup>+</sup> 2 mg/L  
 2. Na<sup>+</sup> 10 mg/L  
 3. NH<sub>4</sub><sup>+</sup> 10 mg/L  
 4. K<sup>+</sup> 20 mg/L  
 5. Mg<sup>2+</sup> 10 mg/L  
 6. Ca<sup>2+</sup> 20 mg/L



With twice increased theoretical plate number, YS-50 provides a higher performance with improved peak shapes compared to YK-421. The quantitation of NH<sub>4</sub><sup>+</sup> in the presence of high Na<sup>+</sup> content is also improved.

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

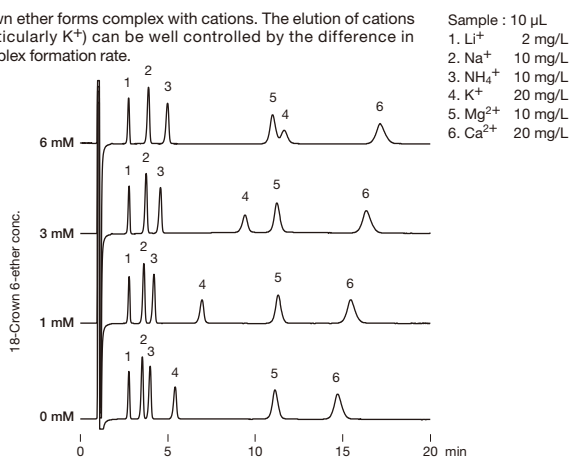
Resolution (Na <sup>+</sup> and NH <sub>4</sub> <sup>+</sup> )	YS-50	YK-421
	2.5	2.1

**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 + 1.5 g/L 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

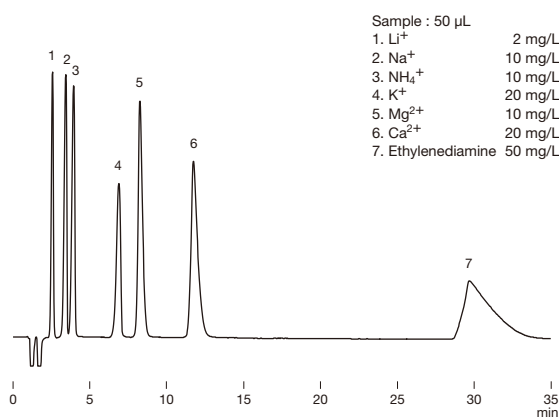
Crown ether forms complex with cations. The elution of cations (particularly K<sup>+</sup>) can be well controlled by the difference in complex formation rate.



Sample : 10 µL  
 1. Li<sup>+</sup> 2 mg/L  
 2. Na<sup>+</sup> 10 mg/L  
 3. NH<sub>4</sub><sup>+</sup> 10 mg/L  
 4. K<sup>+</sup> 20 mg/L  
 5. Mg<sup>2+</sup> 10 mg/L  
 6. Ca<sup>2+</sup> 20 mg/L

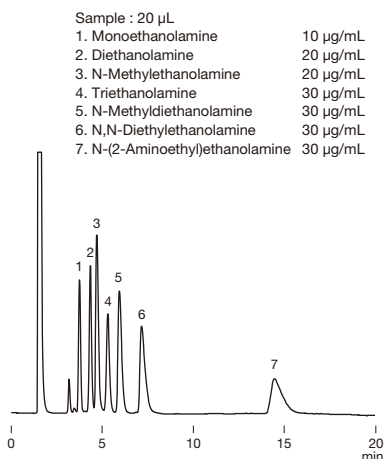
**Column** : Shodex IC YS-50  
**Eluent** : 4 mM Methanesulfonic acid + 18-Crown 6-ether aq.  
**Flow rate** : 1.0 mL/min  
**Detector** : Non-suppressed conductivity  
**Column temp.** : 40 °C

### Simultaneous analysis of cations and ethylenediamine



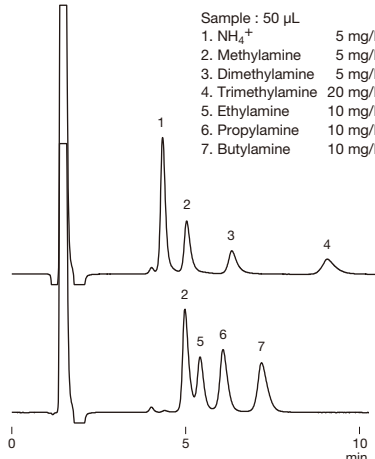
**Column** : Shodex IC YS-50  
**Eluent** : 4 mM HNO<sub>3</sub> + 1.5 mM 18-Crown 6-ether aq. / CH<sub>3</sub>CN=90/10  
**Flow rate** : 1.0 mL/min  
**Detector** : Non-suppressed conductivity  
**Column temp.** : 40 °C

### Amino alcohols



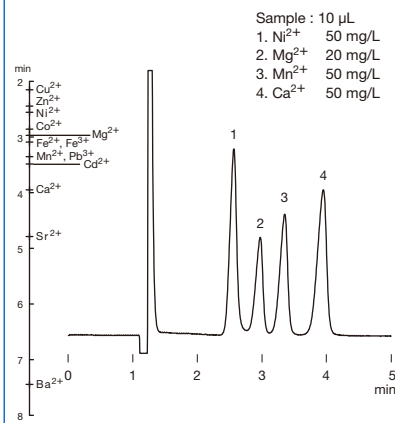
**Column** : Shodex IC YK-421  
**Eluent** : 4 mM HNO<sub>3</sub> aq.  
**Flow rate** : 1.0 mL/min  
**Detector** : Non-suppressed conductivity  
**Column temp.** : 40 °C

### Alkylamines



**Column** : Shodex IC YK-421  
**Eluent** : 4 mM H<sub>3</sub>PO<sub>4</sub> aq./CH<sub>3</sub>CN=90/10  
**Flow rate** : 1.0 mL/min  
**Detector** : Non-suppressed conductivity  
**Column temp.** : 25 °C

### Alkaline earth metal ions



**Column** : Shodex IC Y-521  
**Eluent** : 4 mM Tartaric acid + 2 mM Ethylenediamine aq.  
**Flow rate** : 1.0 mL/min  
**Detector** : Non-suppressed conductivity  
**Column temp.** : 40 °C