columns

# IonPac® CS15 Cation-Exchange Column

Now sold under the Thermo Scientific brand

Thermo SCIENTIFIC


*The IonPac CS15 cation-exchange column is designed for the determination of trace-level ammonium in environmental samples. The CS15 is also ideal for the determination of trace-level sodium in amine-treated cooling waters. Other important applications include the determination of alkylamines and alkanolamines. Sample matrices include environmental waters and soil extracts, power plant waters treated with ammonium, morpholine or ethanolamine, chemical additives, chemical process solutions, scrubber solutions, plating baths, and solvents. The CS15 column requires elevated temperature and solvent for the determination of disparate concentration ratios of sodium and ammonium. The CS16 Column uses an isocratic acid eluent and elevated temperature to determine disparate concentrations of ammonium and sodium (up to 10,000:1) See the IonPac CS16 Product Information Bulletin for more details.*

## For Trace-Level Ammonium or Trace-Level Sodium

The key capabilities for the IonPac CS15 column are the determination of low concentrations of ammonium in the presence of high concentrations of sodium encountered in environmental samples. Its unique retention of potassium makes it ideal for the determination of ammonium in potassium chloride extracts. The column also is ideal for the reverse concentration ratio of low sodium in high concentrations of ammonium, or alkanolamine, typically encountered in the power generation industry. Previously, the determination of these analytes at ratios larger than 1:1000 required column switching.

The CS15 uses a crown ether functionality to enhance the retention of ammonium and potassium ions and low molecular weight amines. This unique selectivity makes the CS15 ideal for the separation of sodium, ammonium, and ethanolamine as shown in Figure 1.

## Unique Carboxylate Cation Exchanger

The IonPac CS15 column uses a unique resin that is functionalized with carboxylate and phosphonate cation-exchange sites and crown ether groups, which provide excellent retention of ammonium and potassium. The IonPac CS15 packing is an 8.5-µm diameter solvent-compatible particle consisting of ethylvinylbenzene crosslinked with 55% divinylbenzene.

## Long-Term Durability

The IonPac CS15 packing ensures long-term column stability and trouble-free operation. The column is compatible with acidic eluents and samples. Performance of the high- capacity CS15 column does not deteriorate with the injection of acidic samples up to approximately 50 mN hydronium ion, so acid digests or preserved samples can be injected without pH adjustment.

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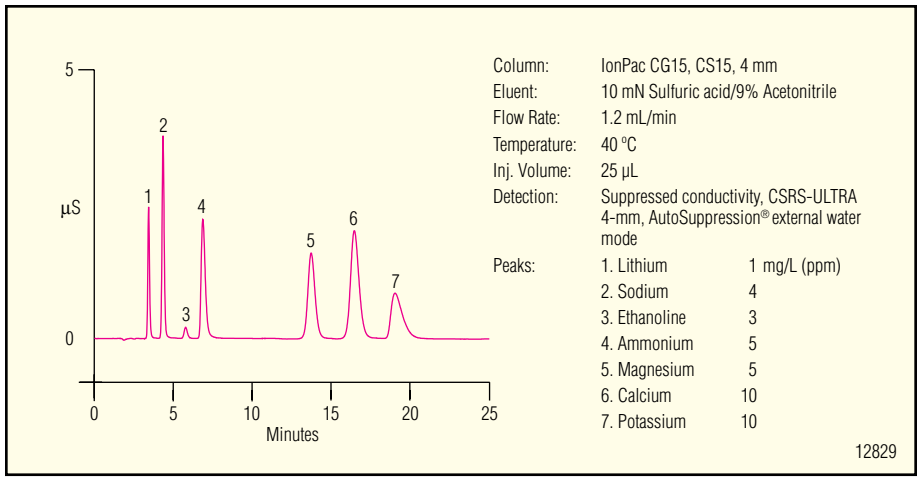



*Figure 1. Isocratic separation of common inorganic cations, ammonium, and ethanolamine.*

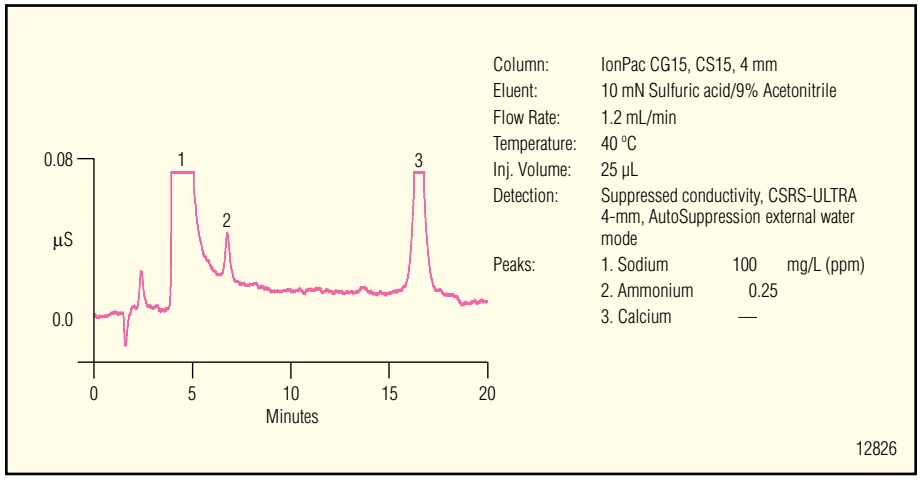



*Figure 2. Determination of trace-level ammonium in environmental wastewater containing a high sodium concentration.*

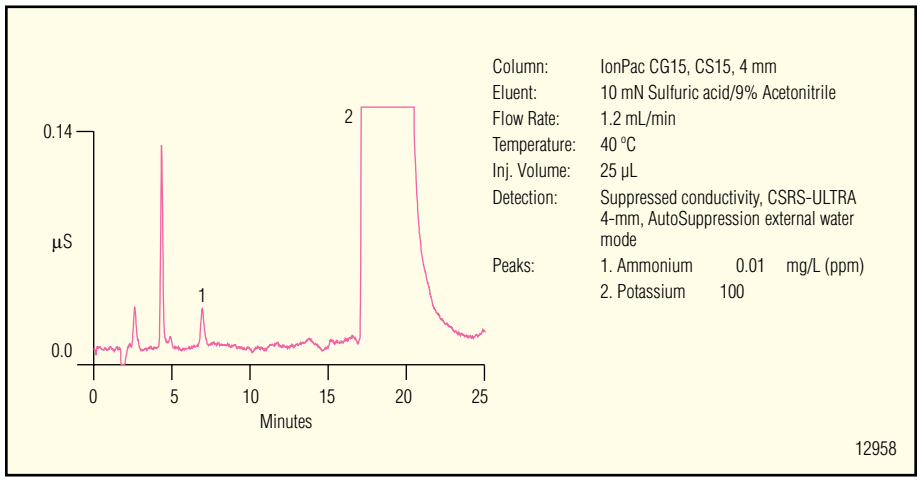



*Figure 3. Determination of trace-level ammonium in a potassium chloride soil extract.*

### Solvent-Compatible Packing

The IonPac CS15 column is 100% solvent-compatible. Adding acetonitrile to the eluent modifies column selectivity and enables the elution of nonpolar analytes or contaminants from the column. Acetonitrile can be used to enhance sample solubility, reduce retention times, and improve peak shapes of hydrophobic amines. Time and expense can be saved by eliminating time-consuming sample preparation steps. This feature allows complex matrices to be analyzed with minimal sample preparation.

### Economical Operation

The IonPac CS15 is designed to reduce operating costs by eliminating the need for diaminopropionic acid hydrochloride (DAP•HCl) in the eluent, which is normally required for divalent cation elution on sulfonated columns. The typical eluent is sulfuric acid or methanesulfonic acid with 9% acetonitrile, which can be used with the Cation Self-Regenerating Suppressor® (CSRS®-ULTRA) in the external water mode for eluent suppression. The IonPac CS15 columns are available in the 2-mm i.d. microbore format to reduce operating costs by up to 75% compared to 4-mm operation.

### High Loading Capacity for Trace-Level Ammonium

The IonPac CS15 replaces step-change and column switching methods for the determination of low concentrations of ammonium in environmental waters. The IonPac CS15 column chemistry improves resolution of sodium from ammonium and alkanolamines, even for samples high in ionic strength. Figures 2 and 3 illustrate the determination of trace levels of ammonium in brine and soil extract samples.

### High Loading Capacity for Trace-Level Sodium

The IonPac CS15 is easy to install and use in current trace-level cation applications that previously required eluent step changes or column switching. This column is intended to replace column switching methods for the de-

termination of trace-level sodium at low µg/L (ppb) concentrations in ammonium and amine-treated cooling waters.

The IonPac CS15 column chemistry improves resolution of sodium from ammonium and alkanolamines even for samples high in ionic strength. Figure 4 illustrates the determination of trace concentrations of sodium in industrial cooling waters treated with ammonium.

## Determination of Alkanolamines in Complex Matrices

The IonPac CS15 can be used to monitor the amine content in the quality control of chemical additives, process solutions, plating baths, and scrubber solutions. The crown ether functionality forms a strong interaction with cations such as potassium, ammonium, and ethanolamine. This interaction increases the retention times of these cations. As a result, the CS15 is ideal for the determination of alkanolamines in the presence of high-ammonium or high-potassium concentrations.

Figure 5 illustrates the separation of monoethanolamine, diethanolamine, triethanolamine, and Group I and Group II cations in one run. Eluent conditions can be optimized for the specific amines of interest.

## Increased Flexibility for Methods Development

The methanesulfonic acid or sulfuric acid eluent concentration can be optimized for fast determination of Group I and Group II cations present at similar concentrations, as shown in Figure 6.

The solvent compatibility of the IonPac CS15 permits the use of HPLC organic solvents in the eluent to modify ion-exchange selectivity. Either methanesulfonic acid or sulfuric acid concentration gradients with simultaneous organic solvent gradients can be used to achieve optimum resolution of closely eluting analyte pairs. Figure 7 illustrates the use of eluent gradients to separate ethylamines from Groups I and II cations. Eluent conditions can be optimized for the specific amines of interest.

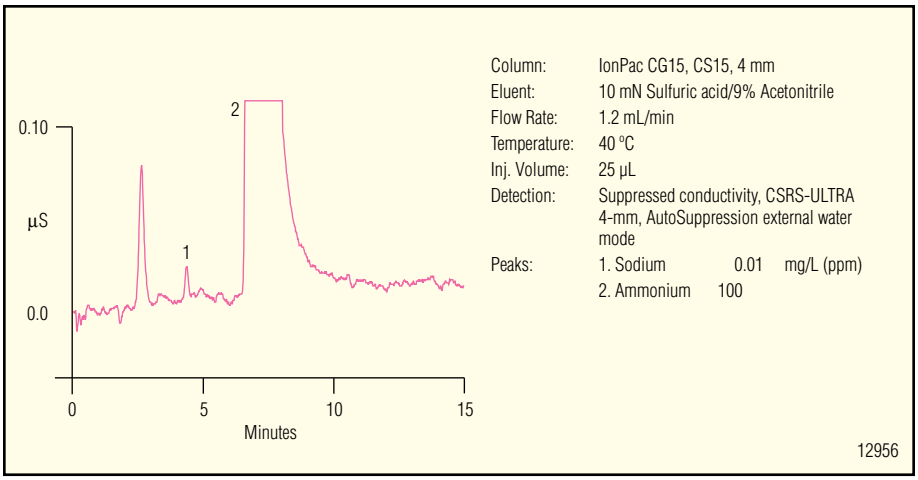



*Figure 4. Determination of trace quantities of sodium in cooling waters treated with ammonium.*

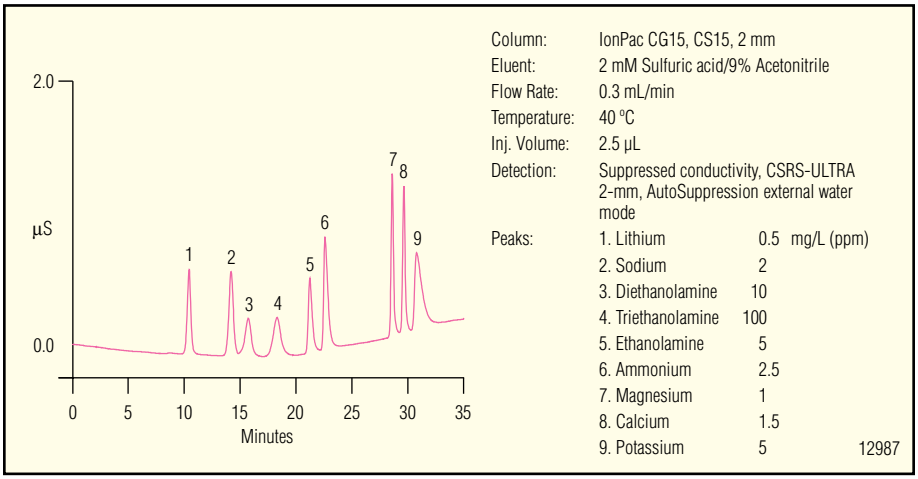



*Figure 5. Fast, aqueous gradient separation of alkanolamines, ammonium, and alkali and alkaline earth cations.*

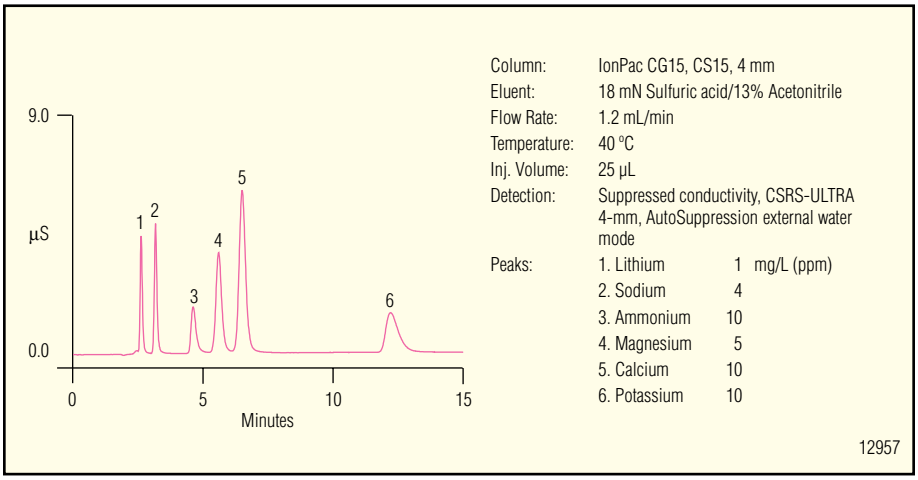
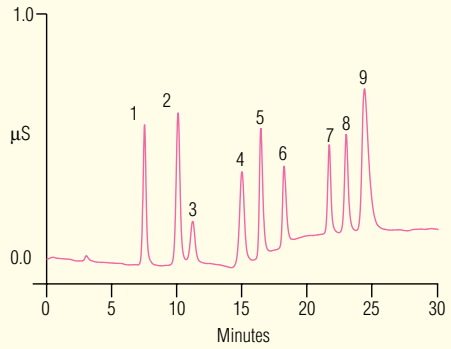



*Figure 6. Group 1 and Group II cations and ammonium at similar concentrations can be resolved with 18 mN sulfuric acid/13% acetonitrile eluent.*

## Ordering Information

For elevated temperature work at 40 °C, with solvent, use the IonPac CS15 column with the Cation Self-Regenerating Suppressor (CSRS-ULTRA) operated in external water mode. When performing concentrator work, use the IonPac CG15 or TCC-LP1 as the concentrator column. When performing gradient cation-exchange applications on the IonPac CS15, install a CTC Cation Trap Column between the gradient pump and the injection valve to remove cationic contaminants from the eluent.




| | |
|---|---|
| Column: | IonPac CG15, CS15, 2 mm |
| Eluent: | 2.5 mM Methanesulfonic acid/6% Acetonitrile for 10 min, to 14 mM Methanesulfonic acid/6% Acetonitrile |
| Flow Rate: | 0.3 mL/min |
| Temperature: | 40 °C |
| Inj. Volume: | 2.5 µL |
| Detection: | Suppressed conductivity, CSRS-ULTRA 2-mm, AutoSuppression external water mode |

| Peaks: | | |
|---|---|---|
| 1. Lithium | 0.5 | mg/L (ppm) |
| 2. Sodium | 2 | |
| 3. Diethylamine | 2.5 | |
| 4. Triethylamine | 10 | |
| 5. Ammonium | 5 | |
| 6. Ethylamine | 2.5 | |
| 7. Magnesium | 0.5 | |
| 8. Calcium | 1 | |
| 9. Potassium | 5 | |

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*Figure 7. An eluent gradient can be used to optimize the resolution of ethylamines from Group I and Group II cations.*

## SPECIFICATIONS

*Dimensions:*
Analytical Column:
2 x 250 mm and 4 x 250 mm
Guard Column:
2 x 50 mm and 4 x 50 mm

*Maximum Operating Pressure:*
27 MPa (4000 psi)

*Mobile Phase Compatibility:*
Acidic eluents, 100% acetonitrile.
**Alcohols should be avoided.**

Substrate Characteristics:
Bead Diameter: 8.5 µm
Crosslinking (%DVB): 55%

*Functional Group Characteristics:*
Capacity:
700 µeq/column (2 x 250 mm)
2800 µeq/column (4 x 250 mm)

*Ion-Exchange Group:*
Carboxylic acid, phosphonic acid, and crown ether

*Surface Characteristics:*
Medium hydrophilic

*Column Construction:*
PEEK with 10-32 threaded ferrule-style end fittings. All components are nonmetallic.

## ORDERING INFORMATION

In the U.S., call 1-800-346-6390, order online at http://dstore.dionex.com or contact the Dionex regional office nearest you. Outside the U.S., order through your local Dionex office or distributor. Refer to the following part numbers.

| Description | Part Number |
|---|---|
| **IonPac CS15 Columns** | |
| IonPac CS15 Analytical Column (4 x 250 mm) | 051795 |
| IonPac CG15 Guard Column (4 x 50 mm) | 052200 |
| IonPac CS15 Analytical Column (2 x 250 mm) | 052252 |
| IonPac CG15 Guard Column (2 x 50 mm) | 052256 |
| **CTC Cation Trap Columns** | |
| CTC-1 Cation Trap Column, 9 x 24 mm For gradient operation of 4-mm columns | 040192 |
| CTC (2 mm) Cation Trap Column, 4 x 35 mm For gradient operation of 2-mm columns | 043132 |
| **Cation Concentrator Columns** | |
| TCC-LP1 Trace Concentrator Column, 4 x 35 mm For both 4-mm and 2-mm concentrator work using carboxylated columns. Very low pressure allows manual syringe or autosampler loading | 046027 |



**Passion. Power. Productivity.**

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