

Ion chromatography

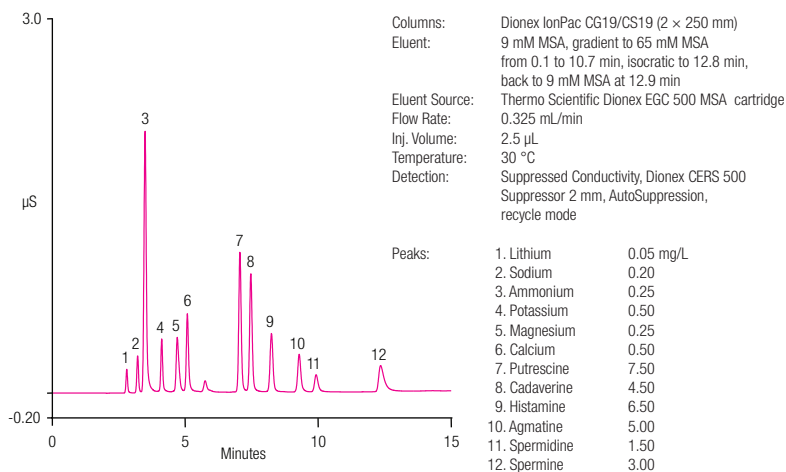
Thermo Scientific Dionex IonPac CS19 Cation-Exchange Column

The Thermo Scientific™ Dionex™ IonPac™ CS19 Cation-exchange Column has moderately high capacity and moderate hydrophobicity, and is recommended for isocratic and gradient separations of polar amines such as alkanolamines, methylamines, and moderately hydrophobic amines including biogenic amines. The Dionex IonPac CS19 column is ideally used with a Thermo Scientific™ Dionex™ Reagent-Free™ Ion Chromatography (RFIC™) System for automatic methanesulfonic acid (MSA) eluent generation and electrolytic eluent suppression with conductivity detection. Available Dionex IonPac CS19 column formats include 2 × 250 mm and 4 × 250 mm, allowing flow rates from 0.25 mL/min to 1.5 mL/min.

Superior chromatographic performance

- Universal column for polar amines, including alkanolamines and methylamines in diverse sample matrices.
- Universal column for moderately hydrophobic amines including biogenic amines.
- Simplified RFIC system requires only a deionized water source to produce MSA eluent.

Separation of Biogenic Amines and Common Inorganic Cations Using the Dionex IonPac CS19 Column



NOTE: Concentrations are only approximate.

- More rugged and reliable column for most Thermo Scientific™ Dionex™ IonPac™ CS18 Column applications.
- RFIC eluent suppressors (Thermo Scientific™ Dionex™ CERS™ 500 Cation Electrolytically Regenerated Suppressor and trap column (Thermo Scientific™ Dionex™ CR-CTC Continuously Regenerated Cation Trap Column) together provide electrolytic suppression with minimal baseline shift during gradients and enhanced analyte sensitivity.
- Compatible with 10% organic solvents such as acetonitrile and acetone (excluding alcohols) to enhance analyte solubility, modify column selectivity, and allow effective column cleanup.
- Moderately high capacity: 2400 μeq/col (4 × 250 mm column). Allows easier analysis of high ionic strength samples.
- Samples include power plant waters treated with ammonium, morpholine or ethanolamine, chemical additives, refinery scrubber solutions, personal care products, and foods.

Unique carboxylate cation exchanger for small amines

The Dionex IonPac CS19 column is a unique moderately hydrophobic, moderately high capacity, weak cation exchanger designed for polar amines, and moderately hydrophobic amines, plus the common inorganic cations using suppressed conductivity detection. The supermacroporous resin bead structure of the Dionex IonPac CS19 column is composed of a polymeric 5.5 µm substrate consisting of ethylvinyl benzene cross-linked with 55% divinylbenzene. The raw resin bead is then grafted with weak carboxylic acid groups as shown in Figure 1. The Dionex IonPac CS19 resin bead is produced using a novel low surface area substrate. All commercially available grafted cation exchange materials make use of high surface area substrates which provide good capacity but tend to preclude good peak shape, especially for hydrophobic cations which interacts strongly with the substrate surface. The Dionex IonPac CS19 resin bead architecture overcomes these issues by making use of a low surface area substrate.

The Dionex IonPac CS19 column offers optimum isocratic resolution of sodium, ammonium, and ethanolamine. The common inorganic cations can be separated by gradient elution from methylamine, dimethylamine, and trimethylamine. The column is polymer-based and can be used with eluents of pH 0–7. This column is compatible with 10% of the organic solvents used with IC (acetonitrile and acetone). The Dionex IonPac CS19 column allows gradient elution to resolve difficult analyte pairs and reduce total run time, all with minimal baseline shift during gradients.

Common inorganic cations

The common inorganic cations plus ammonium are separated on the Dionex IonPac CS19 column with 8 mM MSA eluent in approximately 11 min, as shown in Figure 2. Figure 3 illustrates the

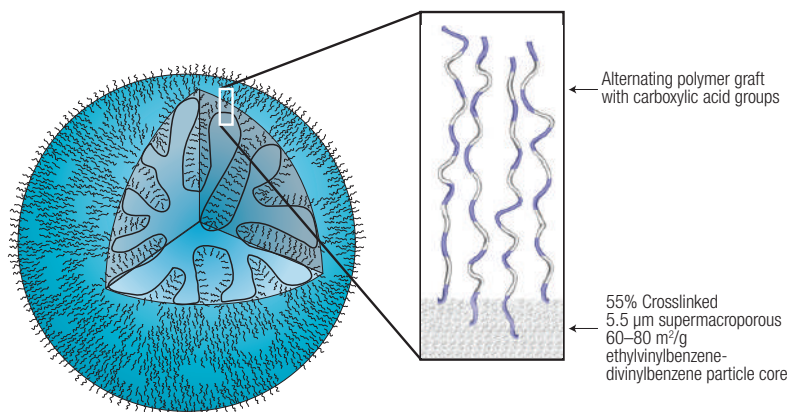


Figure 1. Structure of a Dionex IonPac CS19 packing particle.

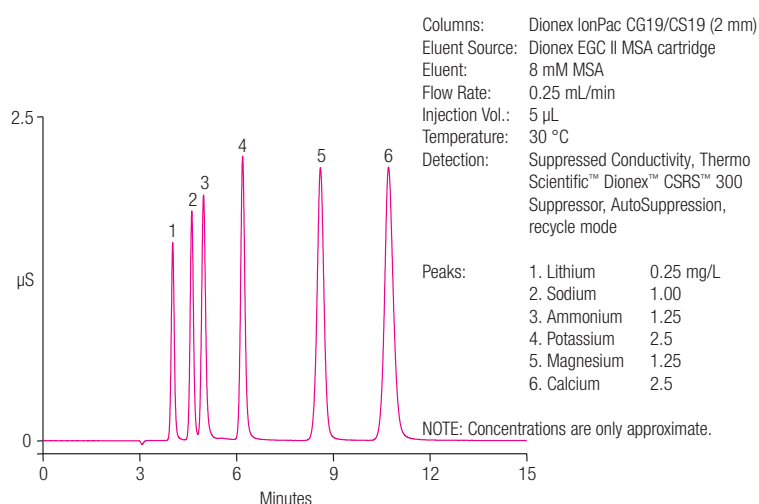


Figure 2. Isocratic separation of six common cations using the Thermo Scientific™ Dionex™ IonPac™ CG19/CS19 Columns.

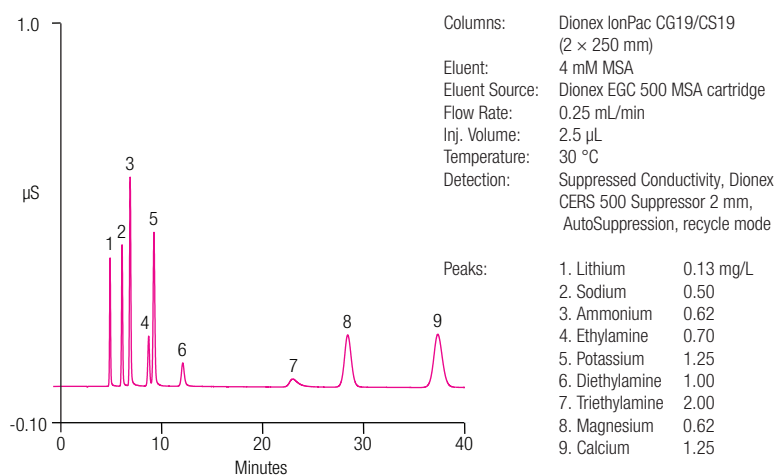


Figure 3. Isocratic elution of the six common cations plus ethylamines using the Dionex IonPac CG19/CS19 columns (2 mm).

separation of the common inorganic cations, plus ammonium and ethylamines. Using 4 mM MSA coupled with suppressed conductivity detection, these analytes can be separated in approximately 26 min.

Determination of alkanolamines and the common inorganic cations

Alkanolamines, including monoethanolamine, diethanolamine, and triethanolamine, are most commonly used individually, but are also used in combination to optimize scrubber treatment efficiency for specific chemical processes. In large plants, different alkanolamines may be used in adjacent units to accommodate different scrubbing requirements. The Dionex IonPac CS19 column has unique selectivity for alkanolamines and therefore can resolve mixtures of these priority scrubber amines using a 4 mM MSA isocratic eluent with suppressed conductivity detection, as illustrated in Figure 4.

Determination of ammonium and the Group I and II cations

The Dionex IonPac CS19 column is the recommended column for the determination of ammonium and the common inorganic cations in diverse sample matrices, including scrubber solutions, process streams, and wastewater. Ammonium and the Group I and II cations are separated and elute with excellent peak efficiencies and symmetries when the column is run with a simple isocratic eluent, as illustrated in Figure 5.

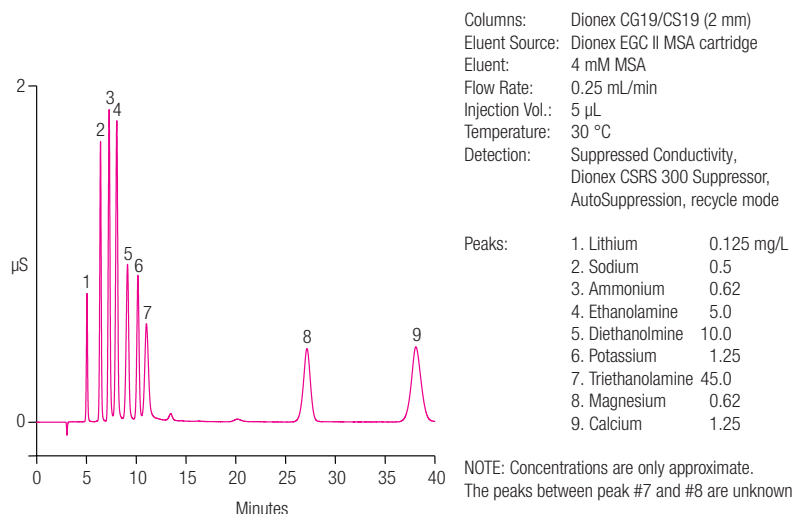


Figure 4. Separation of alkanolamines and the common inorganic cations using the Dionex IonPac CG19/CS19 columns.

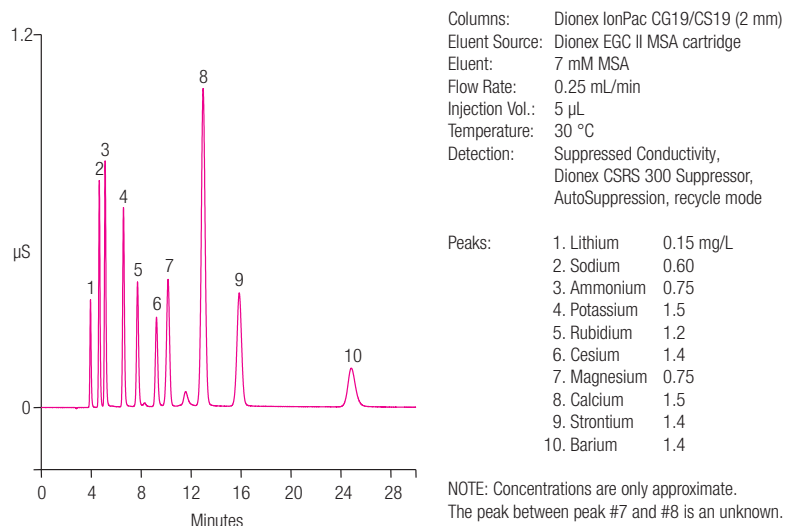


Figure 5. Separation of ammonium and the Group I and Group II inorganic cations on the Dionex IonPac CG19/CS19 columns.

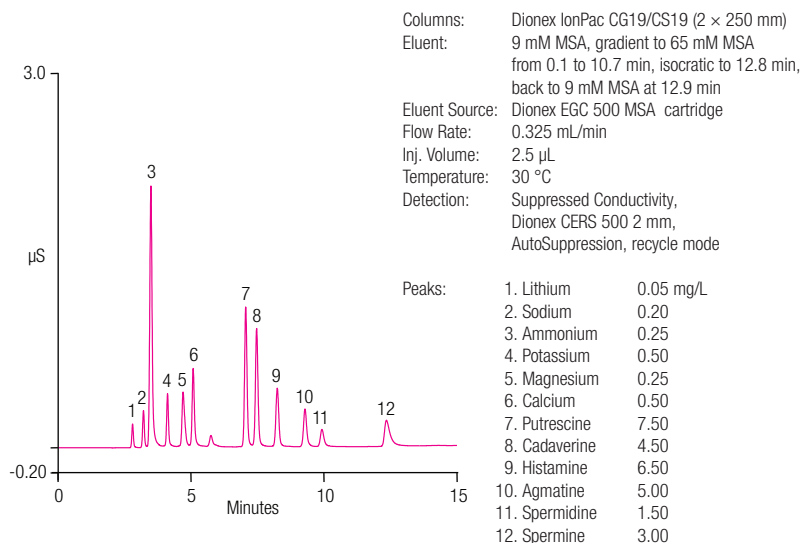
Determination of biogenic amines and the Group I and II cations

Biogenic amines including putrescine, cadaverine, histamine, spermine, and spermidine are important to monitor in foods because they are indicators of spoilage. As shown in Figure 6, the Dionex IonPac CS19 column can easily separate the common cations and biogenic amines using an aqueous eluent without the need for organic solvent. Using the optimized gradient and increased flow rate shown in Figure 6, the biogenic amines and cations elute with good peak efficiencies and symmetries in less than 12 min.

Using the Dionex IonPac CS19 column and suppressed conductivity detection, these biogenic amines can easily be determined in complex food matrices. Amperometric detection can also be used to detect biogenic amines. This detection mode provides the advantage of specificity for oxidizable amines including the biogenic amines. Inorganic cations present in the sample are not detected using amperometric detection.

Solvent-compatible packing

The Dionex IonPac CS19 column is compatible with up to 10% organic solvents, such as acetonitrile and acetone. Alcohols can only be used at very low flow rates to avoid high pressure on the column. Thus, alcohols can be present as the matrix in samples or can be used for washing the column at 1/5 of the standard flow rate for the column format. Adding acetonitrile to the eluent modifies column selectivity and enables the elution of nonpolar analytes, hydrophobic analytes, or contaminants from the column. Acetonitrile can be used to enhance sample solubility, reduce retention times due to hydrophobic interactions, and improve the peak shapes of hydrophobic amines. Time and expense can be saved by eliminating time-consuming sample preparation steps. This feature allows complex sample matrices to be analyzed with minimal sample preparation.



NOTE: Concentrations are only approximate.

Figure 6. Fast gradient elution of six common cations plus biogenic amines using the Dionex IonPac CG19/CS19 columns (2 mm).

System requirements

The Dionex IonPac CS19 column operated in the suppressed conductivity mode is recommended for use with Dionex Reagent-Free IC (RFIC) systems equipped with an eluent generator. The Dionex IonPac CS19 analytical column can be used with older Dionex IC systems equipped with an eluent generator or a Thermo Scientific™ Dionex™ RFC-30 Reagent-Free Controller. The eluent generator automatically produces methanesulfonic acid gradients from deionized water.

Suppressor recommendations

For optimum ease of use and performance, the Dionex IonPac CS19 analytical column should be used with the Thermo Scientific™ Dionex™ CERS 500 Cation Electrolytically Regenerated Suppressor. We recommend operating the Dionex IonPac CS19 column at a slightly elevated temperature (30 °C) to ensure reproducible retention times in all environmental conditions.

Cation trap columns

When using the eluent generator for eluent delivery and to achieve an almost flat baseline when using gradient elution, we recommend installing a Thermo Scientific™ Dionex™ CR-CTC II Continuously Regenerated Cation Trap Column to remove cationic contaminants from the eluent. The Thermo Scientific™ Dionex™ CR-CTC Trap Column should be installed between the Thermo Scientific™ Dionex™ EGC Eluent Generator Cartridge and the eluent generator degas module.

Alternatively, a Thermo Scientific™ Dionex™ CTC Cation Trap Column can be used with 2 mm and 4 mm columns, and is installed between the gradient pump and the injection valve to remove cationic contaminants from the eluent.

Concentrator columns

For trace analysis work, use the Thermo Scientific™ Dionex™ IonPac™ TCC-LP1, Dionex IonPac TCC-ULP1, or Thermo Scientific™ Dionex™ IonPac™ TCC-XLP1 Cation Concentrator Column when the sample is delivered with a syringe or with an autosampler.

Specifications	
Dimensions	Dionex IonPac CS19 Analytical Column: 2 × 250 mm and 4 × 250 mm
	Dionex IonPac CG19 Guard Column: 2 × 50 and 4 × 50 mm
Maximum operating pressure	3,000 psi (standard and microbore)
Mobile phase compatibility	Acidic eluents (pH 0–7), 10% HPLC solvents, alcohols should be avoided
Substrate characteristics	2 × 250 mm, 4 × 250 mm, 0.4 × 250 mm Supermacroporous resin Particle diameter: 4 µm Pore size: 2,000 Å Crosslinking (%DVB): 55%
	2 × 50 mm, 4 × 50 mm, 0.4 × 50 mm Microporous resin Particle diameter: 8 µm Pore size: < 1 Å Crosslinking (%DVB): 55%
Ion-exchange group	Grafted carboxylic acid
Functional group characteristics	Medium hydrophobic
Capacity (µeq/column)	2410 µeq/column (4 × 250 mm)
	46 µeq/column (4 × 50 mm)
	600 µeq/column (2 × 250 mm)
	11 µeq/column (2 × 50 mm)
Column construction	PEEK™ with 10–32 threaded ferrule style end fittings
	All components are nonmetallic

Ordering information

To order in the U.S., call 1-800-346-6390, or contact the Thermo Fisher Scientific office nearest you. Outside the U.S., order through your local Thermo Fisher Scientific office or distributor. Refer to the following part numbers.

Description	Part number
Analytical and Guard Columns	
Dionex IonPac CS19 Analytical Column (4 × 250 mm)	076026
Dionex IonPac CG19 Guard Column (4 × 50 mm)	076027
Dionex IonPac CS19 Analytical Column (2 × 250 mm)	076028
Dionex IonPac CG19 Guard Column (2 × 50 mm)	076029
Trap Columns	
Dionex CR-CTC II Continuously Regenerated Cation Trap Column	066262
Dionex CTC-1 Cation Trap Column (9 × 24 mm) (for use with 4 mm columns)	040192
Dionex CTC Cation Trap Column (4 × 35 mm) (for use with 2 mm columns)	043132
Trace Cation Concentrator Columns	
Dionex TCC-LP1 Trace Cation Concentrator Low Pressure (4 × 35 mm)	046027
Dionex TCC-ULP1 Trace Cation Concentrator Ultralow Pressure (5 × 23 mm)	063783
Dionex TCC-XLP1 Trace Cation Concentrator Extremely Low Pressure (6 × 16 mm)	063889

 Learn more at thermofisher.com/ic