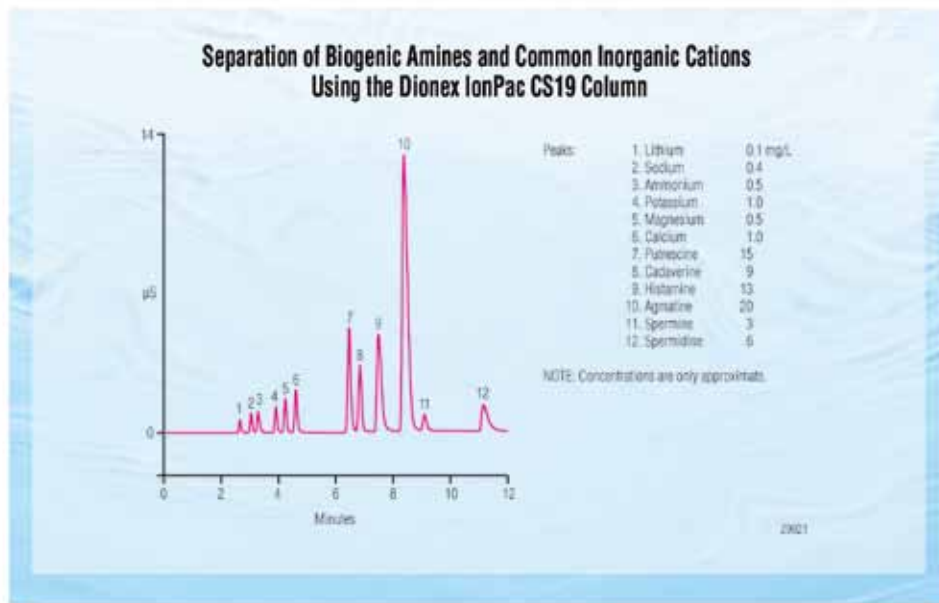


## Thermo Scientific Dionex IonPac CS19 Cation-Exchange Column



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 Reagent-Free™ Ion Chromatography (RFIC™) systems for automatic methanesulfonic acid (MSA) eluent generation and electrolytic eluent suppression with conductivity detection. Available Dionex IonPac CS19 column formats include 0.4 × 250 mm, 2 × 250 mm, and 4 × 250 mm, allowing flow rates from 10 µL/min to 1.5 mL/min.

Now sold under the  
Thermo Scientific brand

**Thermo**  
SCIENTIFIC

### 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.
- The Dionex IonPac CS19 capillary and microbore columns offer reduced eluent consumption and reduced operating costs.
- More rugged and reliable column for most Dionex IonPac CS18 applications.
- RFIC eluent suppressors (Thermo Scientific Dionex CSRS™ 300 or Thermo Scientific Dionex CCES™ 300) 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 100% 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 complex sample matrices.
- Sample matrices include power plant waters treated with ammonium, morpholine or ethanolamine, chemical additives, chemical process solutions, refinery scrubber solutions, personal care products, and food samples.

 **DIONEX**

Part of Thermo Fisher Scientific

## Unique Carboxylate Cation Exchanger for Small Amines

The Dionex IonPac CS19 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  $\mu\text{m}$  substrate consisting of ethylvinyl benzene cross-linked with 55% divinylbenzene. The raw resin bead is then grafted with weak carboxylic acid groups. (See Figure 1). The Dionex IonPac CS19 resin bead is produced using a novel technology, different from previous grafting technologies. This technology involves the combination of monomer properties in the functional layer, the nature of the polymeric substrate bead, and the monomer attachment method—the composite of which results in a column with unique performance.

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 100% of the typical organic solvents (acetonitrile and acetone). The Dionex IonPac CS19 column facilitates gradient elution to resolve difficult analyte pairs and reduce total run time, all with minimal baseline shift during gradients.

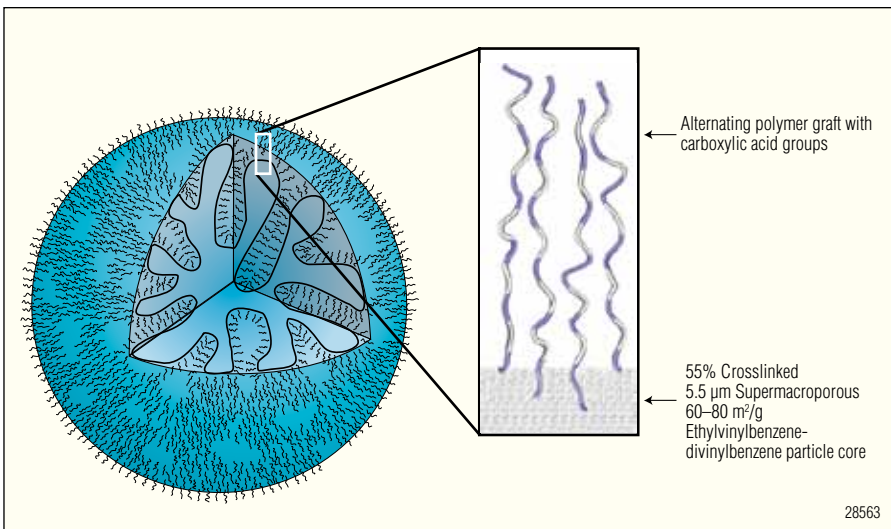


Figure 1. Structure of a Dionex IonPac CS19 packing particle.

### 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 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.

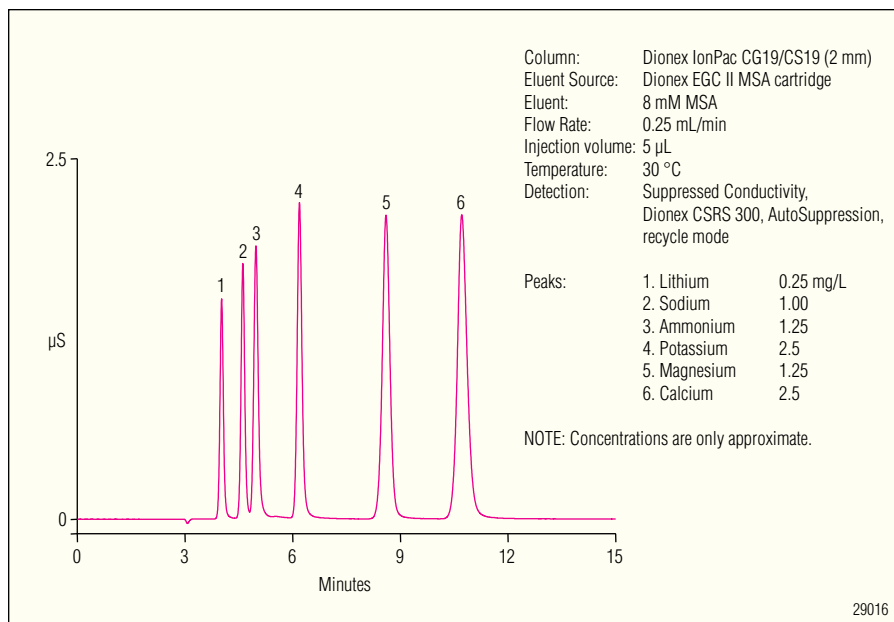


Figure 2. Isocratic separation of six common cations using the Dionex IonPac CG19/CS19 column.

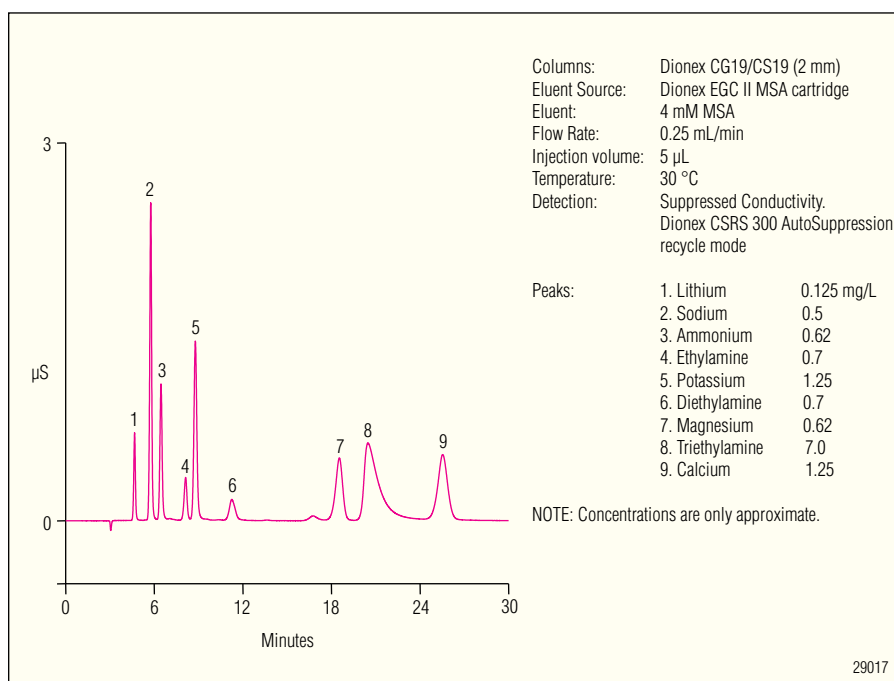


Figure 3. Separation of six common cations plus ethylamines using the Dionex IonPac CG19/CS19 column.

## 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.

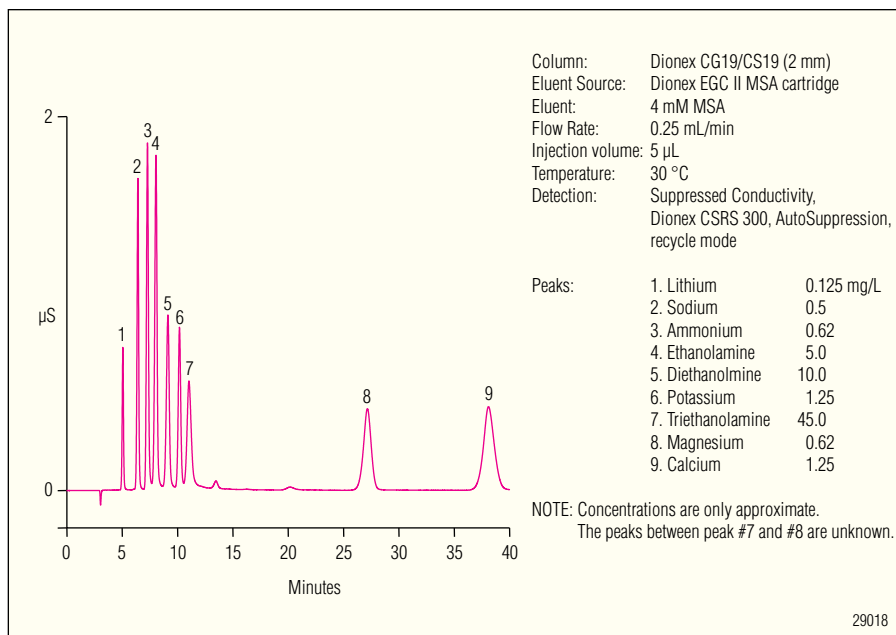


Figure 4. Separation of alkanolamines and the common inorganic cations using the Dionex IonPac CG19/CS19 column.

## 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.

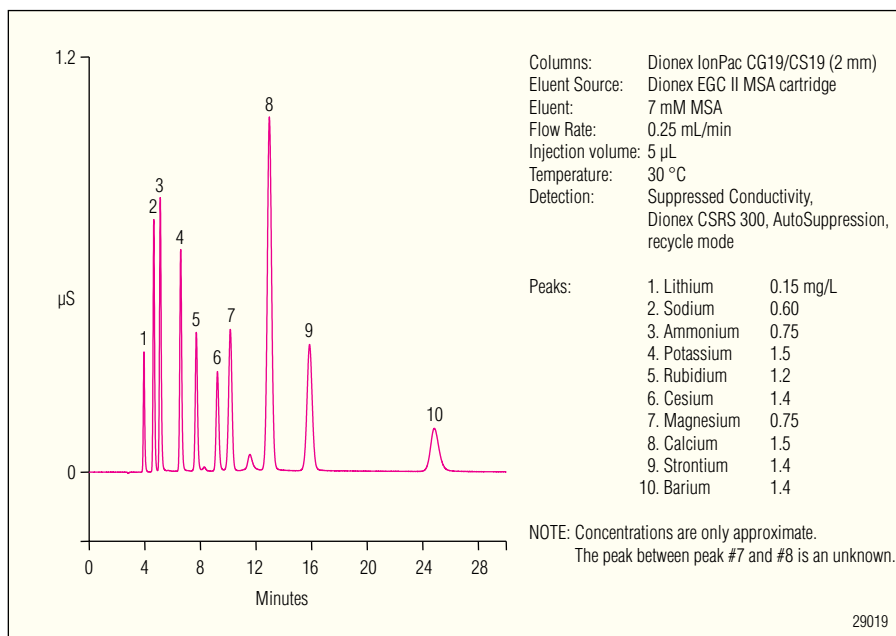


Figure 5. Separation of ammonium and the Group I and Group II inorganic cations on the Dionex IonPac CG19/CS19 column.

## Gradient Separation of Six Common Inorganic Cations and Methylamines

The Dionex IonPac CS19 column is ideally suited to separate the six common inorganic cations plus small, hydrophilic amines, including methylamines in a single run using a modest acidic gradient at 40 °C. Figure 6 shows an optimized MSA gradient separation of these amines, plus the common inorganic cations.

## Determination of Biogenic Amines and the Group I and II Cations

Biogenic amines including putrescine, cadaverine, spermine, spermidine, and histamine are important to monitor in foods because they are indicators of food spoilage. As shown in Figure 7, the Dionex IonPac CS19 column can easily separate the common cations and biogenic amines using an aqueous eluent without organic solvent added. Using the optimized gradient and increased flow rate shown in Figure 7, 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.

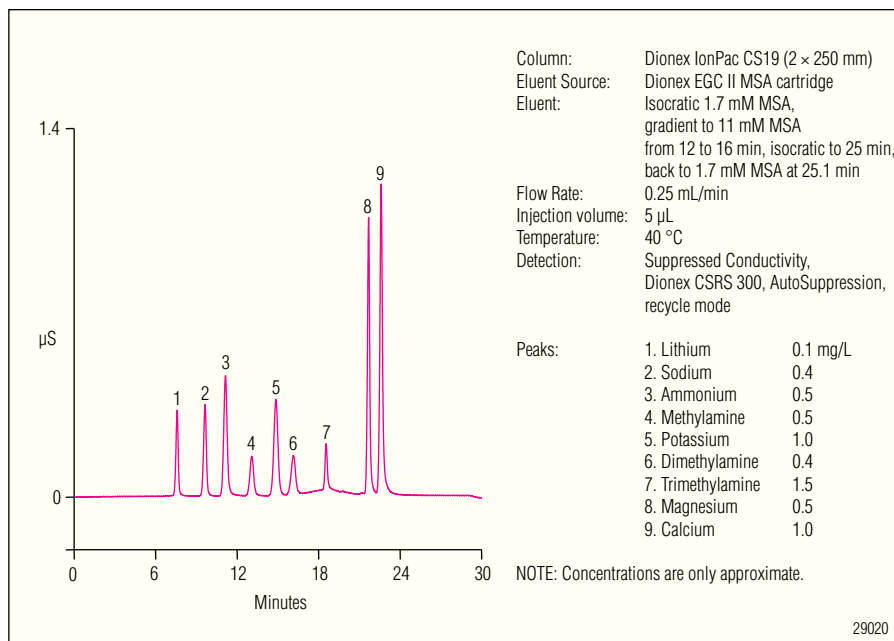


Figure 6. Gradient separation of methylamines and the common inorganic cations using the Dionex IonPac CS19 column.

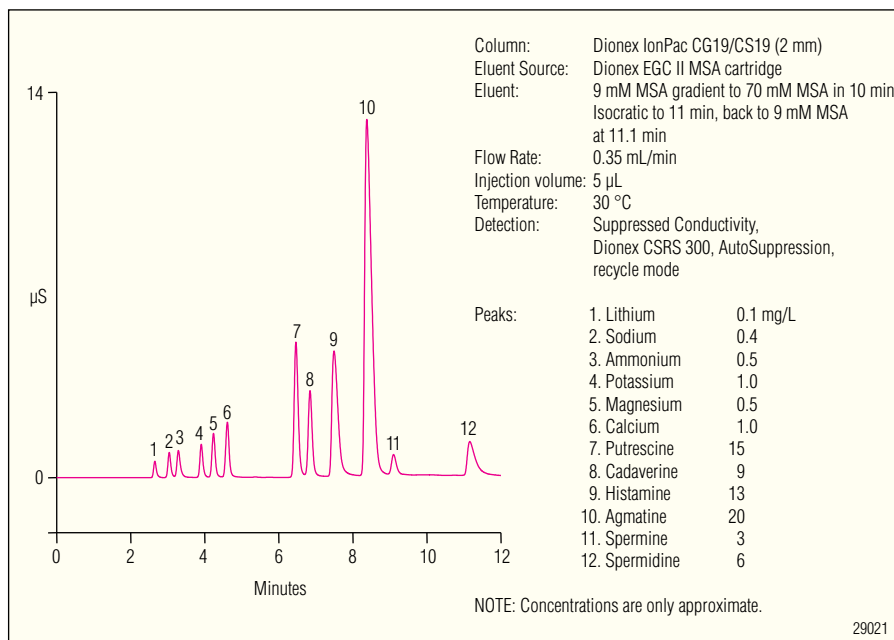


Figure 7. Biogenic amines and the common six cations separated using the Dionex IonPac CG19/CS19 column.

## Determination of Cations Methylamines and Imidazoles

The caramel color in foodstuffs such as colas is the by-product of a pressurized treatment that combines sugar with ammonia, leaving behind 2- and 4-methylimidazoles. California has already added 4-methylimidazole to its list of chemicals known to cause cancer. The Dionex IonPac CS19 column can separate the common cations and methylamines from 2- and 4-methyl imidazole using a simple gradient at elevated temperature as shown in Figure 8.

## Determination of Paraquat and Diquat

Paraquat and diquat are nonselective cationic contact herbicides, commonly used in commercial weed killer formulations for domestic weed control. Paraquat, an analog of diquat, is a pesticide of high toxicity to humans. The Dionex IonPac CS19 column can separate paraquat and diquat from the common cations using a simple gradient as shown in Figure 9.

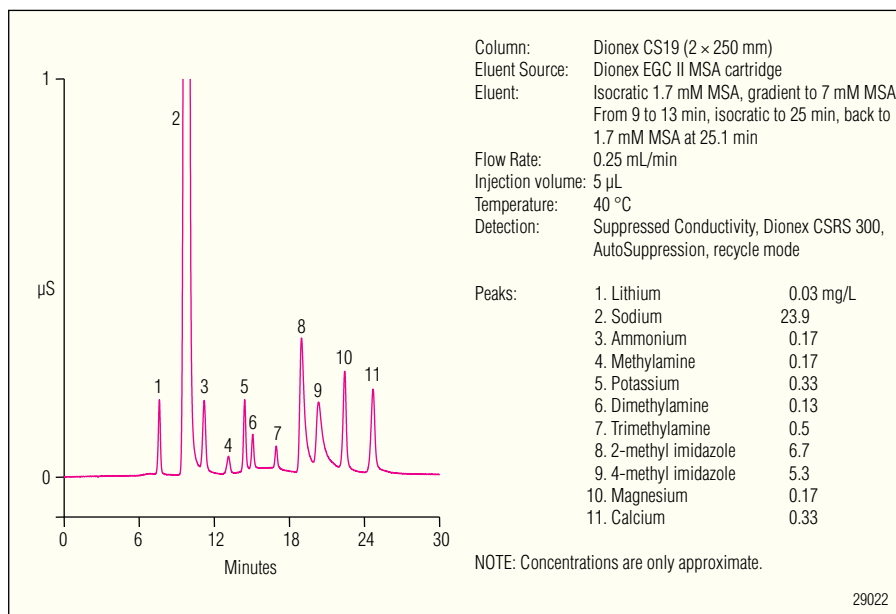


Figure 8. Gradient separation of six common cations, methylamines and imidazoles using the Dionex IonPac CS19 (2 mm).

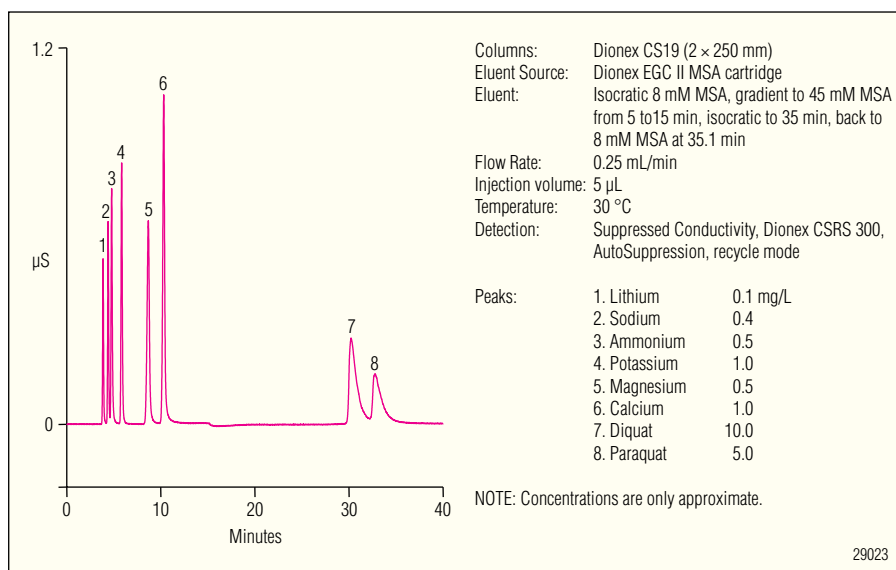


Figure 9. Gradient separation of six common cations plus paraquat and diquat using the Dionex IonPac CS19 (2 mm).

### **Solvent-Compatible Packing**

The Dionex IonPac CS19 column is compatible with up to 100% 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.

### **System Requirements**

The Dionex IonPac CS19 column operated in the suppressed conductivity mode is recommended for use with the Thermo Scientific Dionex ICS-2100 or ICS-5000 RFIC systems equipped with an eluent generator. Capillary columns (0.4 mm) require the use of a Dionex ICS-5000 capillary IC system. The Dionex IonPac CS19 analytical column can be used with older Dionex IC Systems equipped with an eluent generator or a 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 Dionex CSRS 300 Cation Self-Regenerating Suppressor or the Dionex CCES 300 Cation Capillary Electrolytic Suppressor for the Dionex IonPac CS19 capillary column. 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 utilizing gradient eluents, we recommend using a Dionex CR-CTC Continuously Regenerated Cation Trap Column to remove cationic contaminants from the eluent. The Dionex CR-CTC should be installed between the EGC 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 TCC-LP1, TCC-ULP1, or TCC-XLP1 Cation Concentrator Column when the sample is delivered with a syringe or with an autosampler.

For concentrator work with a 0.4 mm capillary column, use the Thermo Scientific Dionex IonSwift™ MCC-100 concentrator column.

## 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

*Dionex IonPac CS19 Capillary Column:*  
0.4 × 250 mm

*Dionex IonPac CS19 Capillary Guard Column:*  
0.4 × 50 mm

### Maximum Operating Pressure:

3000 psi (standard, microbore,  
and capillary)

### Mobile Phase Compatibility:

Acidic eluents (pH 0–7), 100% HPLC  
solvents, alcohols should be avoided.

### Substrate Characteristics:

Bead Diameter (µm):

4 mm: 5.5 µm

2 mm: 5.5 µm

0.4 mm: 5.5 µm

Guards: 8 µm

Crosslinking: 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)

24 µeq/column (0.4 × 250 mm)

0.5 µeq/column (0.4 × 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 Dionex  
Regional Office nearest you. Outside the U.S., order through your  
local Dionex office or distributor. Refer to the following part numbers.

### Analytical and Guard Columns Part Number

Dionex IonPac CS19 Capillary Column (0.4 × 250 mm) .....076024

Dionex IonPac CG19 Capillary Guard Column (0.4 × 50 mm) 076025

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 Part Number

Dionex CR-CTC II Continuously Regenerated Cation

Trap Column .....066262

Dionex CR-CTC Continuously Regenerated Cation Trap Column

(Capillary) (for use with Capillary Cation Columns) .....072079

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 Part Number

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

Dionex MCC-100 Monolith Cation Concentrator Column

(0.5 × 80 mm) .....075462

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Speed • Simplicity • Solutions



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