IONPAC® CS14 CATION EXCHANGE COLUMN

DIONEX

The IonPac CS14 cation-exchange column provides fast, isocratic separation of aliphatic amines, alkanolamines, ammonium, alkali, and alkaline earth cations using methanesulfonic acid or sulfuric acid eluents. Solvent compatibility allows solvent to be used to control cation-exchange selectivity, to enhance sample solubility, and for easy column clean-up after the analysis of complex matrices. Typical applications include the determination of alkyl amines, alkanolamines, and cyclic amines such as morpholine or cyclohexylamine in the presence of lithium, sodium, ammonium, potassium, magnesium, and calcium. Sample matrices include chemical additives; chemical process solutions; scrubber solutions and plating baths; waste water; soil extracts; and solvents.

Now sold under the Thermo Scientific brand

Thermo SCIENTIFIC

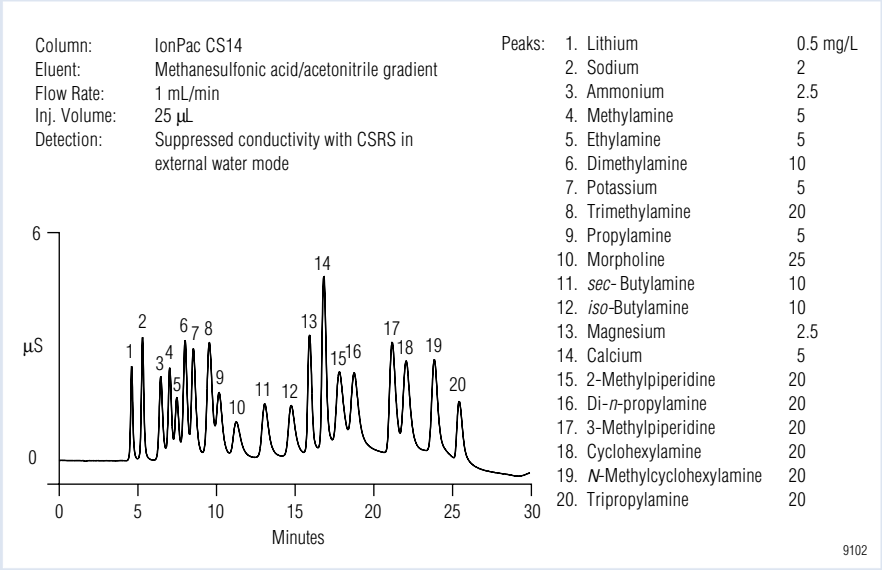

Figure 1 *Gradient separation of aliphatic amines, alkali, and alkaline earth cations on an IonPac CS14 column using a methanesulfonic acid/acetonitrile gradient.*

FAST GRADIENT PROFILES OF ALIPHATIC AMINES, ALKALI, AND ALKALINE EARTH CATIONS

The unique selectivity of the IonPac CS14 allows a large number of aliphatic amines and Group I and Group II cations to be resolved. Figure 1 illustrates the separation of an extensive group of aliphatic amines and Group I and Group II cations from a single injection on a CS14.

UNIQUE CARBOXYLATE CATION EXCHANGER

The IonPac CS14 column is a hydrophilic, carboxylate-functionalized cation exchanger that provides excellent aliphatic amine peak efficiency and peak shape. The IonPac CS14 packing is an 8.0-µm diameter macroporous particle consisting of ethylvinylbenzene crosslinked with 55% divinylbenzene. The substrate is functionalized with hydrophilic carboxylic acid, which permits the elution of monovalent and divalent cations using a dilute hydronium ion eluent such as methanesulfonic acid. To suppress eluent conductivity, the IonPac CS14 can be used with the Cation Self-Regenerating Suppressor (CSRS) in the AutoSuppression™ Mode.

Hydrochloric acid can also be used as an eluent with equivalent chromatography; however, the CSRS must be used in the Chemical Suppression Mode with tetrabutylammonium hydroxide regenerant.

LONG-TERM DURABILITY

The IonPac CS14 packing is functionalized with a unique carboxylate functional group that ensures long-term column stability. The column is compatible with acidic eluents and samples. The performance of the IonPac CS14 does not deteriorate with the injection of acidic samples up to approximately 20 mM in hydronium ion, so acid-digested or acid-preserved samples can be injected without pH adjustment.

SOLVENT COMPATIBLE PACKING

Because the IonPac CS14 column is 100% HPLC-solvent compatible, organic solvents such as acetonitrile can be used for efficient column clean-up or to enhance sample solubility. Time and money can be saved by eliminating time-consuming sample preparation steps. This feature allows complex matrices to be analyzed with minimal sample preparation and extends the utility of the column to new applications requiring solvents. Adding organic solvents to the eluent modifies column selectivity and enables the elution of nonpolar analytes or contaminants from the column with good peak efficiency. The Cation Self-Regenerating Suppressor can be used in the AutoSuppression External Water Mode for the suppression of eluents containing organic solvents.

ECONOMICAL OPERATION

The IonPac CS14 is designed to improve aliphatic amine separations and reduce operating costs by eliminating the need for diaminopropionic acid hydrochloride (DAP•HCl) in the eluent to elute divalent cations. Typical eluents are methanesulfonic acid (MSA) or sulfuric acid, which can be used with the AutoSuppression electrolytic mode of the Cation Self-Regenerating Suppressor (CSRS). The IonPac CS14 cation-exchange columns are available in the 2-mm i.d. microbore format, so operating costs can be reduced by up to 75% compared to a 4-mm operation.

HIGH LOADING CAPACITY

The IonPac CS14 column is designed to improve aliphatic amine peak shape and efficiency and improve resolution of Group I and II cations and aliphatic amines, even for samples high in ionic strength. Figure 2 illustrates the determination of trace levels of lithium, sodium, ammonium, potassium, magnesium, and calcium in high purity power plant cooling waters treated with morpholine. The IonPac CG14 guard column was used as the concentrator column in this application.

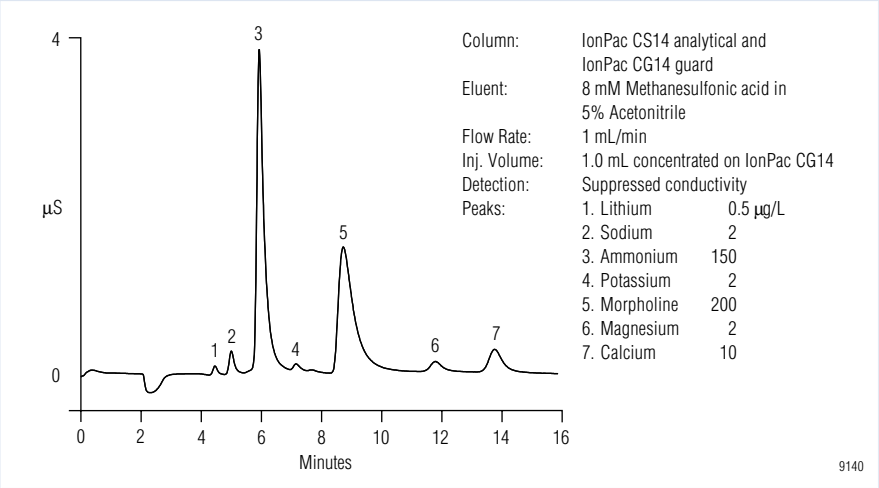

Figure 2 Determination of trace quantities of lithium, sodium, ammonium, potassium, magnesium, and calcium in high-purity power plant cooling waters treated with morpholine.

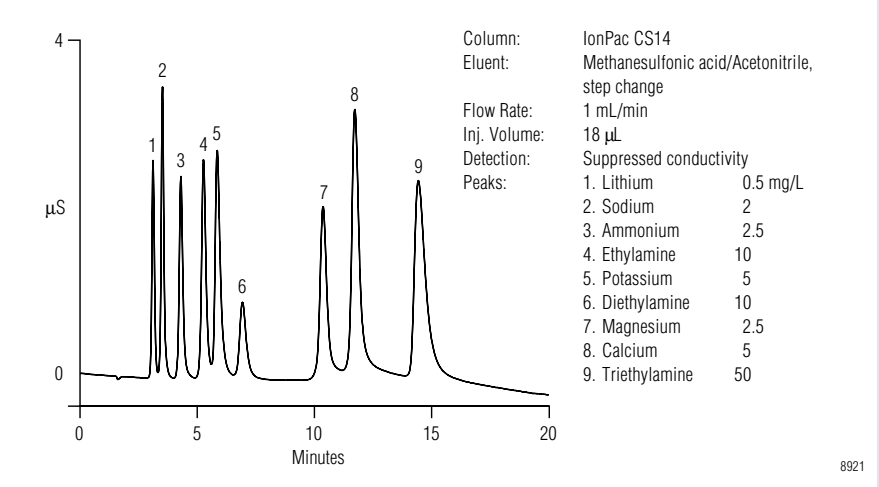

Figure 3 Acetonitrile can be used to optimize the resolution of ethylamines from Group I and Group II cations.

INCREASED FLEXIBILITY FOR METHODS DEVELOPMENT

The solvent compatibility of the IonPac CS14 permits the use of HPLC organic solvents in the eluent to modify cation-exchange selectivity. Both methanesulfonic acid concentration gradients and simultaneous organic solvent gradients can be used to achieve optimum resolution of closely eluting analyte pairs. Figure 3 illustrates the use of acetonitrile in the eluent to optimize the separation of several closely eluting analyte pairs. By using solvent, ethylamine is positioned before potassium. The retention of the more hydrophobic member of an unresolved pair is decreased even further by the addition of solvent.

FAST ISOCRATIC SEPARATION OF ALKANOLAMINES, ALKALI, AND ALKALINE EARTH CATIONS

Figure 4 illustrates the isocratic separation of triethanolamine and Group I and Group II cations from a single injection. Eluent conditions can be optimized for the specific amines of interest. Since the eluent contains solvent, the Cation Self-Regenerating Suppressor is operated in the Auto-Suppression External Water Mode to suppress the eluent.

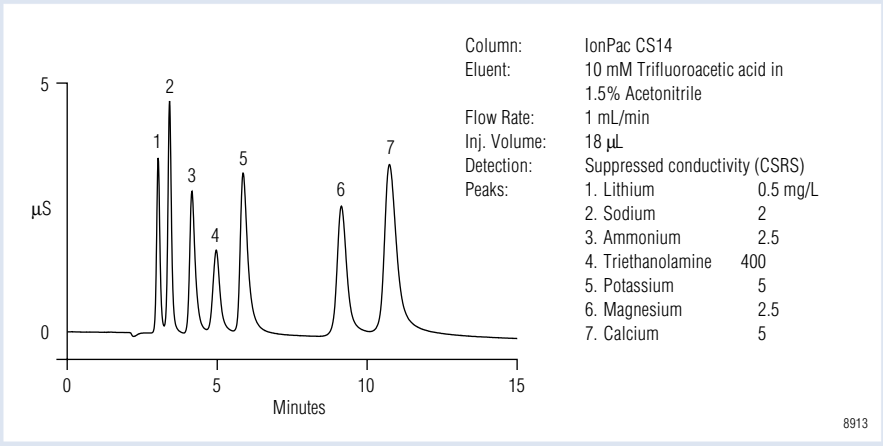

Figure 4 Fast, isocratic separation of triethanolamine, alkali, and alkaline earth cations on an IonPac CS14 column.

DETERMINATION OF HYDROPHOBIC AMINES

Since the IonPac CS14 is 100% solvent-compatible, organic solvents can be used to modify ion-exchange selectivity. For highly retained hydrophobic amines such as propylamines and butylamines, retention times can be significantly decreased and peak efficiencies improved by using eluents containing organic solvents. Figure 5 illustrates the separation of hydrophobic monoamines from Group I and Group II cations. In Figure 5A, note that calcium and magnesium elute early when a step change to 40 mM methanesulfonic acid is used. In Figure 5B, retention of the butylamines is significantly decreased by the addition of an acetonitrile step change from 2% to 10%. Calcium and magnesium elute later when a lower concentration of MSA is used.

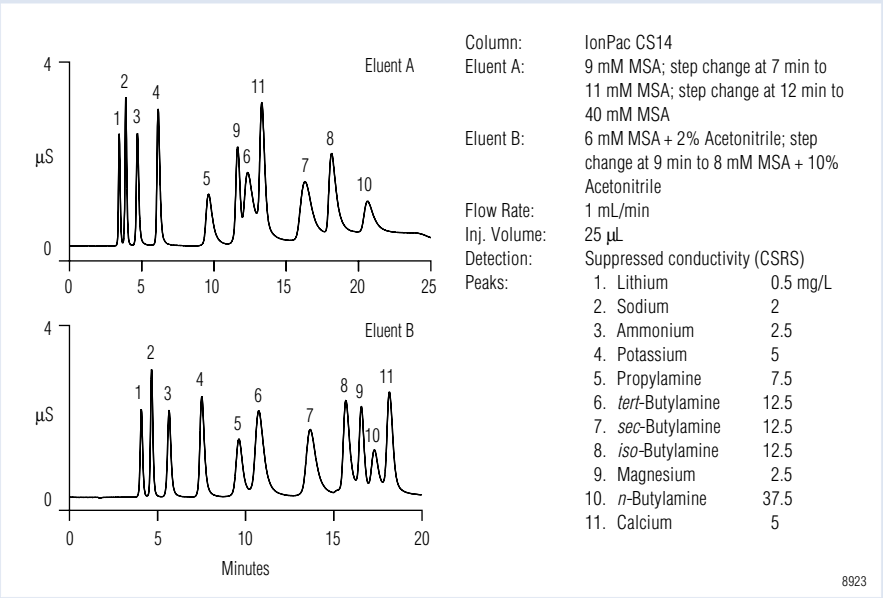

Figure 5 The effect of acetonitrile on the separation of hydrophobic monoamines from Group I and Group II cations.

DETERMINATION OF MANGANESE FOR CORROSION MONITORING

Manganese in cooling waters can be quantified using the IonPac CS14. Pyrophosphoric acid is added to the methanesulfonic acid eluent to enhance the resolution of magnesium, manganese, and calcium. The pyrophosphoric acid complexes preferentially with the manganese, causing it to elute before magnesium. Figure 6 shows the separation of manganese from lithium, sodium, ammonium, potassium, magnesium, and calcium.

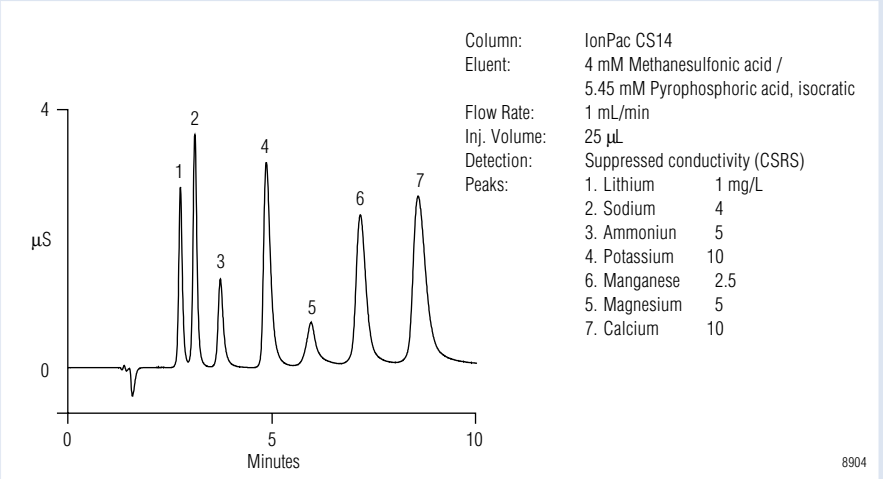

Figure 6 Isocratic determination of manganese in the presence of lithium, sodium, ammonium, potassium, magnesium, and calcium.

SPECIFICATIONS

Dimensions:
IonPac CS14 Analytical Column:
2 x 250 mm and 4 x 250 mm
IonPac CS14 Guard Column:
2 x 50 mm and 4 x 50 mm

Maximum Operating Pressure:
27 MPa (4000 psi)

Mobile Phase Compatibility:
Acidic Eluents
0–100% HPLC solvents

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

Substrate Characteristics:
Bead Diameter (µm): 8.0 µm
Crosslinking (%DVB): 55 %

Capacity: (µeq/column):
325 µeq (2 x 250 mm)
1300 µeq (4 x 250 mm)

Ion-Exchange Group:
Carboxylic acid

Surface Characteristics:
Moderately hydrophilic

ORDERING INFORMATION

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 part numbers below.

For optimum ease-of-use and economy, the IonPac CS14 column should be used with the Cation Self-Regenerating Suppressor (CSRS). For concentrator work, the TCC-LP1 concentrator column or the IonPac CG14 should be used as the concentrator column. For gradient cation-exchange applications, a Cation Trap Column (CTC) should be installed between the gradient pump and the injection valve to remove cationic contaminants from the eluent.

IonPac CS14 Analytical Column (4 x 250 mm) ..... P/N 44123

IonPac CG14 Guard Column (4 x 50 mm) ..... P/N 44124

IonPac CS14 Analytical Column (2 x 250 mm) ..... P/N 44121

IonPac CG14 Guard Column (2 x 50 mm) ..... P/N 44122

TCC-LP1 Cation Concentrator Column (4 x 35 mm; for 4-mm and 2-mm concentrator work using carboxylated columns; very low backpressure designed for manual syringe loading or AS40 AutoSampler loading) ..... P/N 46027

CTC-1 Cation Trap Column ..... P/N 40192
For gradient operation of 4-mm columns.

CTC (2-mm) Cation Trap Column ..... P/N 43132
For gradient operation of 2-mm columns.

CSRS (4-mm) Cation Self-Regenerating Suppressor ..... P/N 43190
For use with 4-mm columns.

CSRS (2-mm) Cation Self-Regenerating Suppressor ..... P/N 43188
For use with 2-mm columns.

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LPN 034890-01 5M 1/97
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