columns

IonPac® Cryptand™ A1 Anion-Exchange Column

The IonPac Cryptand A1 (3 x 150 mm) is an adjustable capacity anion-exchange column. The Cryptand A1 column is a new advancement in Dionex resin technology which allows column capacity control by changing the cation component of the hydroxide eluent. The Cryptand A1 column uses lithium, sodium or potassium hydroxide eluents with each eluent producing a different column capacity range. This capability is ideal for fast elution of polyvalent anions using low eluent concentrations.

Now sold under the Thermo Scientific brand

Thermo SCIENTIFIC

Superior Chromatographic Performance

- Determination of polyvalent anions including polyphosphates and polysulfonates.
- Determination of common anions and polarizable anions in 10 min.
- Column selectivity optimized for 35 °C operating temperature to ensure reproducible retention times.
- Sodium and lithium hydroxide capacity gradients are recommended for most polyvalent anion applications.
- Potassium hydroxide eluent is recommended for applications requiring high capacity.
- Moderate capacity: 85 µeq per column (3 x 150 mm).
- Compatible with organic solvents to enhance analyte solubility, modify column selectivity, or for effective column clean up.

DIONEX

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Adjustable Capacity Particle Structure

The IonPac Cryptand A1 column uses a unique resin technology based on a cryptand molecule, covalently attached to a macroporous, styrene divinylbenzene resin as illustrated in Figure 1. A cryptand is a bicyclic compound capable of complexing metal cations such as sodium, lithium or potassium. In the presence of metal cations, the cryptand molecule generates a positively charged anion-exchange site.

Lithium hydroxide is used as an eluent for applications requiring a low capacity range. Lithium has a low binding constant with cryptand of ~ 1 and very few ion exchange sites are generated; hence a low capacity range is observed. Sodium hydroxide is used as an eluent for applications requiring a moderate capacity range. Sodium has a binding constant with cryptand of ~ 3.9 and an intermediate anion exchange capacity range is observed. Sodium hydroxide and lithium hydroxide can be used individually or together in capacity gradients for most inorganic anion separations. For applications such as the separation of quinate, glycolate, acetate, and formate, increased retention or a high capacity range is required. For this application, a potassium hydroxide eluent (binding constant ~ 5.4) can be used.

Advantages of Using Capacity Gradients

"Capacity gradients" are the recommended mode of operation for the Cryptand A1 column. Shorter run times and improved peak efficiencies can be achieved using capacity gradients. The gradient starts with an initial eluent of 10 mM sodium hydroxide, producing a moderate capacity anion-exchange surface. The column is converted to a low capacity anion exchange surface with a step change to 10 mM lithium hydroxide at 0.1 min. For cryptand columns, capacity gradients can be used to dramatically shorten run times, rather than using an eluent concentration gradient, which is used with conventional anion exchange columns.

In addition, the Cryptand A1 can be used in the conventional mode with an eluent concentration gradient.

Using capacity gradients allows control of the capacity of the column during the run to control efficiency and method run time. Figure 2 illustrates the use of a capacity gradient for the determination of inorganic anions and polarizable anions. This separation can be accomplished in less than 11 min with excellent separation of the common anions along with excellent peak shape and efficiencies for the hydrophobic anions: iodide, thiosulfate, thiocyanate, and perchlorate. By using a capacity gradient, highly retained anions can be eluted at low eluent concentrations, thus providing lower noise and improved detection limits.

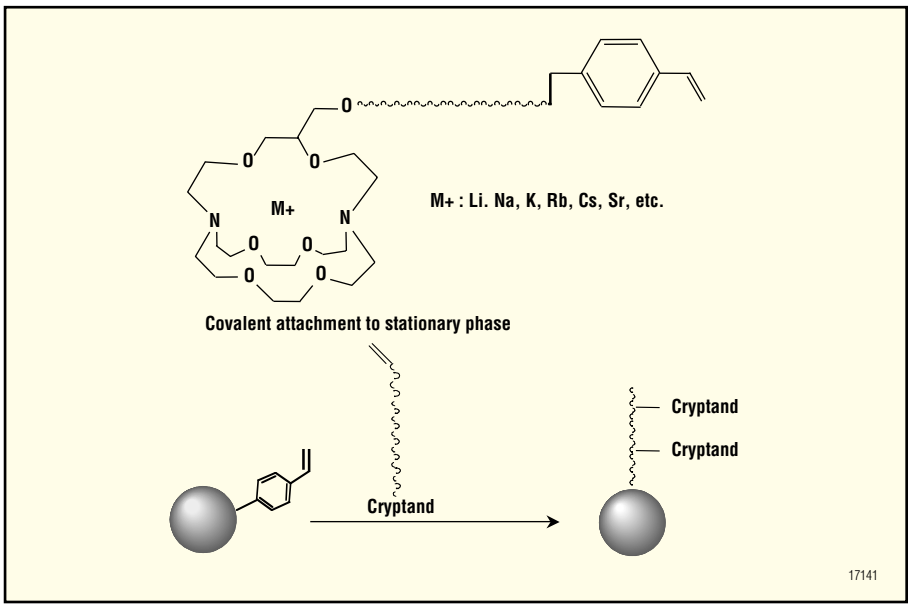

Figure 1. IonPac Cryptand A1 resin.

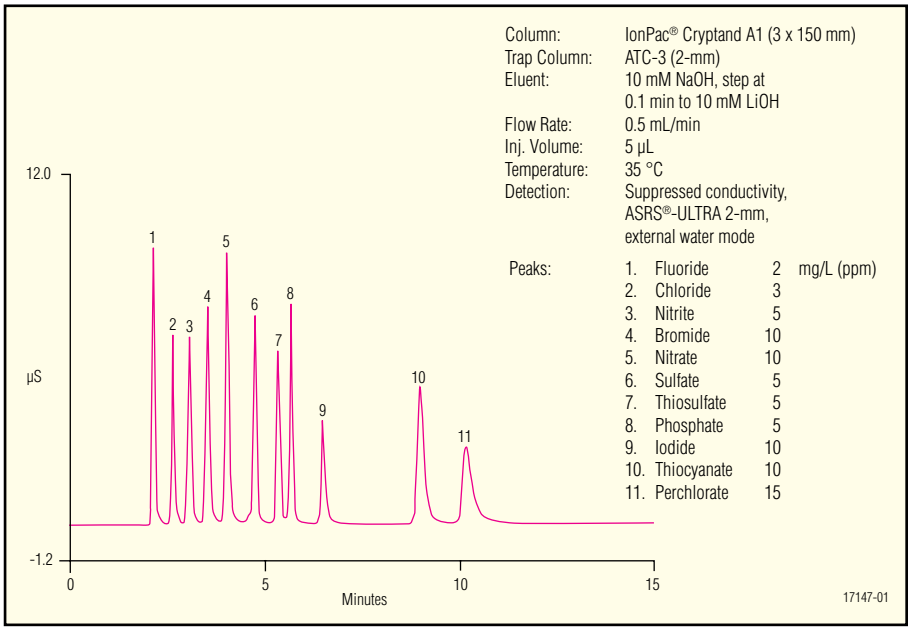

Figure 2. Determination of inorganic anions and polarizable anions using a NaOH/LiOH capacity gradient on the IonPac Cryptand A1 column.

Analysis of Organic Additives in a Chromic Acid Plating Bath

The Cryptand A1 column is ideal for monitoring the concentration of organic additives in chromic acid plating baths. Figure 3 illustrates the separation of methanedisulfonic and ethanedisulfonic acids in a chromic acid plating bath using the Cryptand A1 column with a sodium/lithium hydroxide capacity gradient.

Cryptand A1 for Highly Charged Anions Using a Capacity Gradient

The separation of highly charged anions such as polyphosphates or polysulfonates is possible using a simple capacity gradient. This separation is ideal for monitoring polyphosphates used in a variety of industries in pharmaceutical and detergent formulations, in water treatment applications to decrease water hardness, in cleansers, and in fertilizers. Other applications include polyphosphates used as food additives to control pH and moisture content, to sequester metal ions, and to increase the ionic strength of solutions. Figure 4 illustrates the use of a capacity gradient on the Cryptand A1 column for the separation of polyphosphates in approximately 10 min.

The Cryptand A1 column can also be used to resolve polyvinylsulfonate oligomers as illustrated in Figure 5. The highly charged analytes can easily be separated in less than 20 min using a NaOH/LiOH capacity gradient.

Potassium Hydroxide Eluents for High Capacity Applications

For applications requiring higher capacity, potassium hydroxide eluents are recommended.

Using Temperature

The Cryptand A1 column should be operated at a controlled temperature to achieve reproducible retention times. The Cryptand A1 is designed to operate at 35 °C. Higher temperatures will produce shorter run times. Retention times increase at lower operating temperatures.

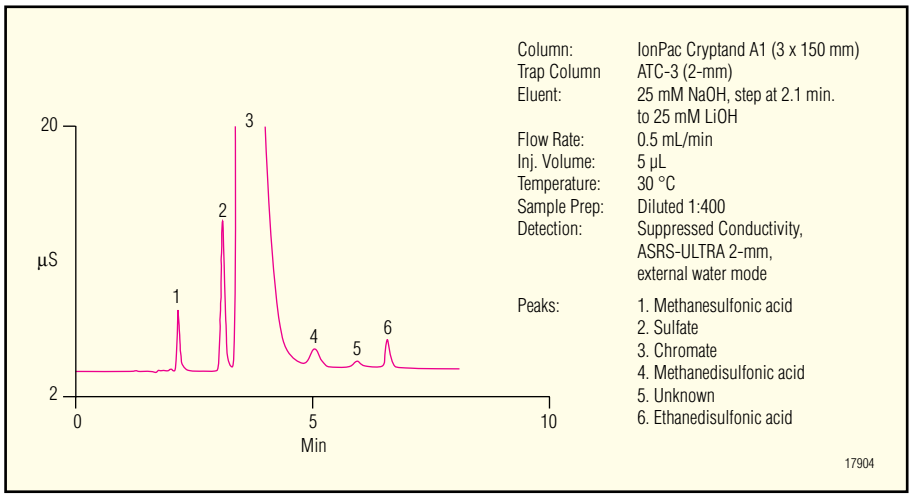

Figure 3. Determination of organic additives in a chromic acid plating bath using the Cryptand A1 column.

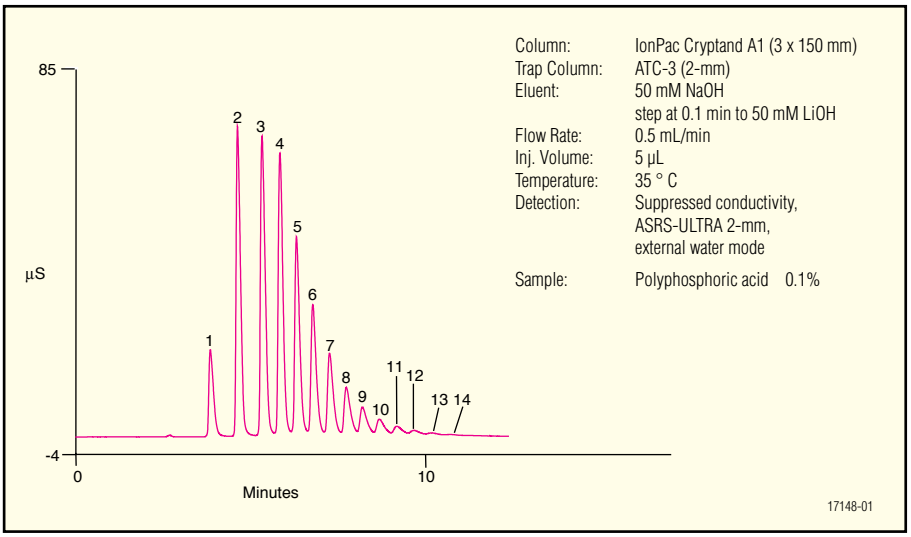

Figure 4. Separation of polyphosphate oligomers on the IonPac Cryptand A1 column using a capacity gradient.

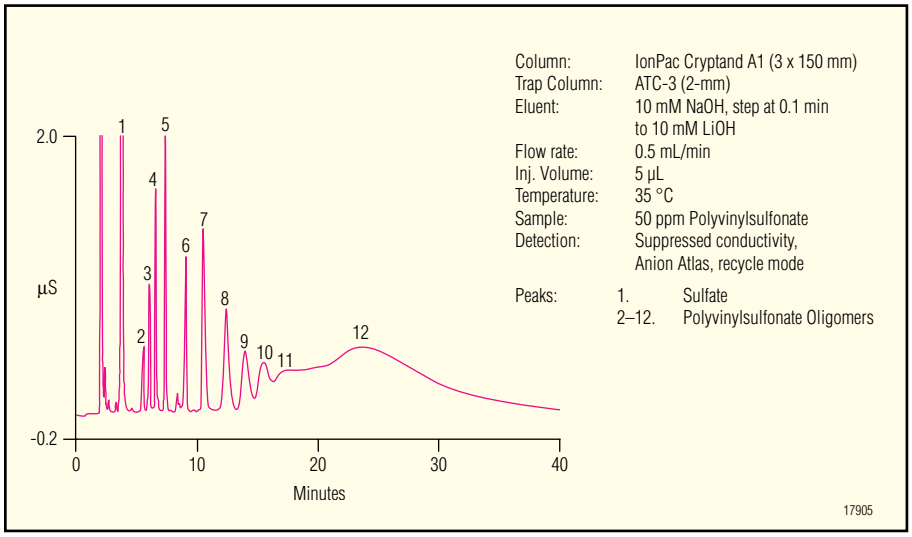

Figure 5. Separation of polyvinylsulfonate oligomers using the Cryptand A1 column.

SPECIFICATIONS

Dimensions:
IonPac Cryptand A1 Analytical Column: 3 x 150 mm
IonPac Cryptand G1 Guard Column: 3 x 30 mm

Maximum Operating Pressure:
4000 psi

Mobile Phase Compatibility:
pH 0–14; 0–100% HPLC solvents

Substrate Characteristics:
Bead Diameter: 5 µm
Pore Size: 100 Å
Crosslinking (%DVB): 55%

Ion Exchange Group:
Grafted cryptand

Functional Group Characteristics:
Variable hydrophobicity (eluent dependent)

Capacity:
85 µeq (3 x 150 mm analytical column)
17 µeq (3 x 30 mm guard column)

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

Suppressor Recommendations

For optimum peak efficiency the IonPac Cryptand A1 column should be used with the 2-mm ASRS® Anion Self-Regenerating Suppressor. The Anion Atlas Electrolytic Suppressor, AAES, can be used with eluents below 25 µeq/min.

Temperature Control

The IonPac Cryptand A1 Column must be operated at an elevated temperature (35 °C) to ensure reproducible retention times.

Bottled Eluents

When using sodium, lithium or potassium hydroxide bottled eluents for gradient anion exchange applications on the Cryptand A1, an Anion Trap Column, the ATC-3 (2-mm), must be installed between the gradient pump and the injection valve to remove anionic contaminants from the eluent. Plastic bottles must be used for eluent preparation and storage.

EG40 Eluents

The EG40 Eluent Generator is used to automatically produce potassium hydroxide gradients from water. When using the EG40 Eluent Generator for potassium hydroxide eluent delivery, an ATC-HC is installed before the EG40 cartridge. An ATC-3 (2-mm) Column should be installed between the EG40 degas module and the injection valve for trace analysis work.

Concentrator Columns

For 3-mm concentrator work, use the IonPac Cryptand G1 (3 x 30 mm) Guard Column.

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 following part numbers.

Column	Part Number
IonPac Cryptand A1 Analytical Column (3 x 150 mm)	059898
IonPac Cryptand G1 Guard Column (3 x 30 mm)	059900
ATC-3 (2-mm) Anion Trap Column (for use with 3-mm columns)	059661
ATC-HC Anion Trap Column (for use with the EG40)	059604

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