



IonPac™ AS32-Fast-4µm anion-exchange column

Fast separation of polarizable anions

Benefits

- Fast analysis of polarizable anions with a simple, isocratic eluent
- Determine perchlorate in high sulfate matrices
- Resolve polythionates such as dithionate, trithionate, and tetrathionate

Keywords

Anion-exchange chromatography, polythionates, dithionate, trithionate, tetrathionate, polarizable anions, non-polar anions, perchlorate, persulfate, aromatic dyes, aromatic sulfonates, sulfonic acid, sulfonated dyes, pigments

The Thermo Scientific™ Dionex™ IonPac™ AS32-Fast-4µm column is a high-capacity, hydroxide-selective anion-exchange column designed for fast determination of highly polarizable anions including polythionates, persulfate, polysulfonated aromatics, aromatic dyes, and pigments. The column's unique selectivity allows for sub-ppb quantification of perchlorate in high sulfate matrices using suppressed conductivity and mass spectrometry detection. For added convenience and increased reproducibility, the column can be used in high-pressure ion chromatography (HPIC) systems equipped with Thermo Scientific™ Dionex™ Eluent Generators that can automatically produce potassium hydroxide eluents from deionized water.

High-efficiency particle structure

The Dionex IonPac AS32-Fast-4 μ m column was developed using a unique polymer bonding technology. The stationary phase consists of a novel, hyper-branched anion-exchange condensation polymer electrostatically attached to the surface of a sulfonated wide-pore polymeric substrate. Alternating cycles of epoxy monomer and amines produce a coating which is grown directly off the substrate as illustrated in Figure 1. Resin capacity is controlled through the number of alternating coating cycles. The Dionex IonPac AS32-Fast-4 μ m column uses a high-capacity resin (126 μ eq/4 mm column) with optimized selectivity for highly polarizable anions. It is composed of a polymeric 4 μ m substrate consisting of ethylvinylbenzene cross-linked with 55% divinylbenzene.

Monitor polythionates in complex matrices

Polythionates are monitored in mining during the leaching of gold and manganese from ore. Tetrathionate is monitored in other industries as its presence can accelerate localized pitting corrosion in stainless steel. Monitoring of polythionates is challenging due to their inherent instability which makes lengthy separation methods impractical. The Dionex IonPac AS32-Fast-4 μ m column can separate dithionate, trithionate, and tetrathionate within approximately 15 min using a hydroxide gradient as shown in Figure 2.

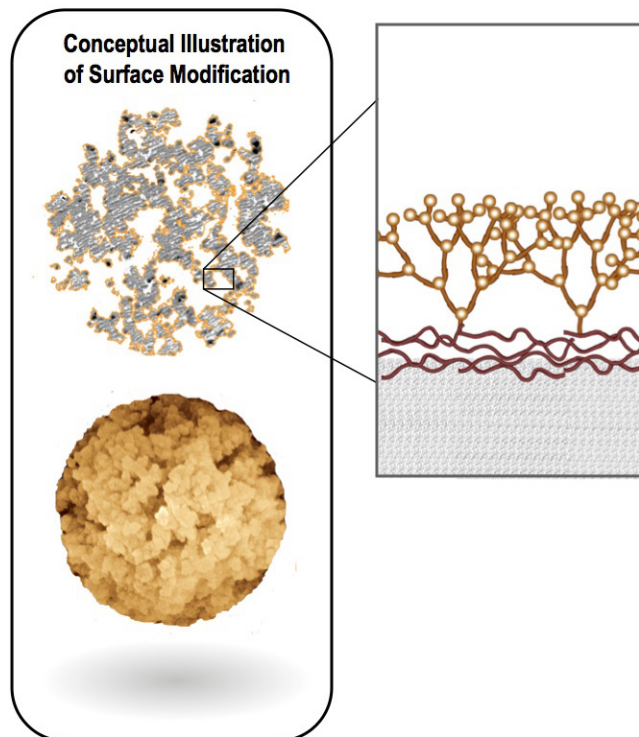
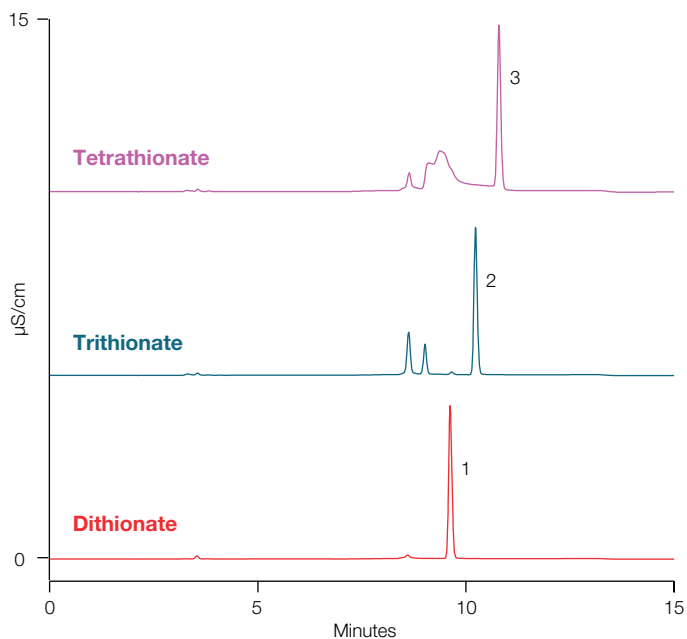


Figure 1. Structure of a Dionex IonPac AS32-Fast-4 μ m column resin particle.



Column:	Dionex IonPac AG32-Fast-4 μ m (2 \times 30 mm)/ Dionex IonPac AS32-Fast-4 μ m (2 \times 150 mm)
Eluent:	4 mM KOH from 0 to 4 min, 4–25 mM KOH from 4 to 10 min, 25 mM KOH from 10 to 15 min
Flow rate:	0.25 mL/min
Inj. volume:	2.5 μ L
Temperature:	30 $^{\circ}$ C
Detection:	Suppressed Conductivity, Dionex AERS 500, 2 mm AutoSuppression, recycle mode
Suppressor current:	16 mA
Peaks:	mg/L
1. Dithionate	25.0
2. Trithionate	25.0
3. Tetrathionate	25.0

Figure 2. Determination of polythionates using a 2 \times 150 mm Dionex IonPac AS32-Fast-4 μ m column set.

Fast determination of perchlorate in high sulfate matrices

Perchlorate is used to make rocket propellants, fireworks, missiles, flares, and explosives. It is also present in some disinfectants, fertilizers, and herbicides. Perchlorate has become a leading public health concern in recent years because it can interfere with the production of thyroid hormones and has been found in drinking water. A unique feature of the Dionex IonPac AS32-Fast-4 μ m column is its ability to elute perchlorate before sulfate as shown in Figure 3. This unique selectivity allows for the determination of disparate ratios of sulfate and

perchlorate as shown in Figure 4. Note that a fast run time of less than 8 min can be achieved using a simple, isocratic eluent. Trace levels of perchlorate can be determined by using the Dionex IonPac AS32-Fast-4 μ m column in conjunction with suppressed conductivity and mass spectrometry detection. Due to its reduced length and therefore reduced capacity, the Dionex IonPac AS32-Fast-4 μ m column is ideal for determining perchlorate in low ionic strength samples. For high ionic strength samples containing high chloride and carbonate, the Dionex IonPac AS16, IonPac AS16-4 μ m, or IonPac AS20 columns are recommended.

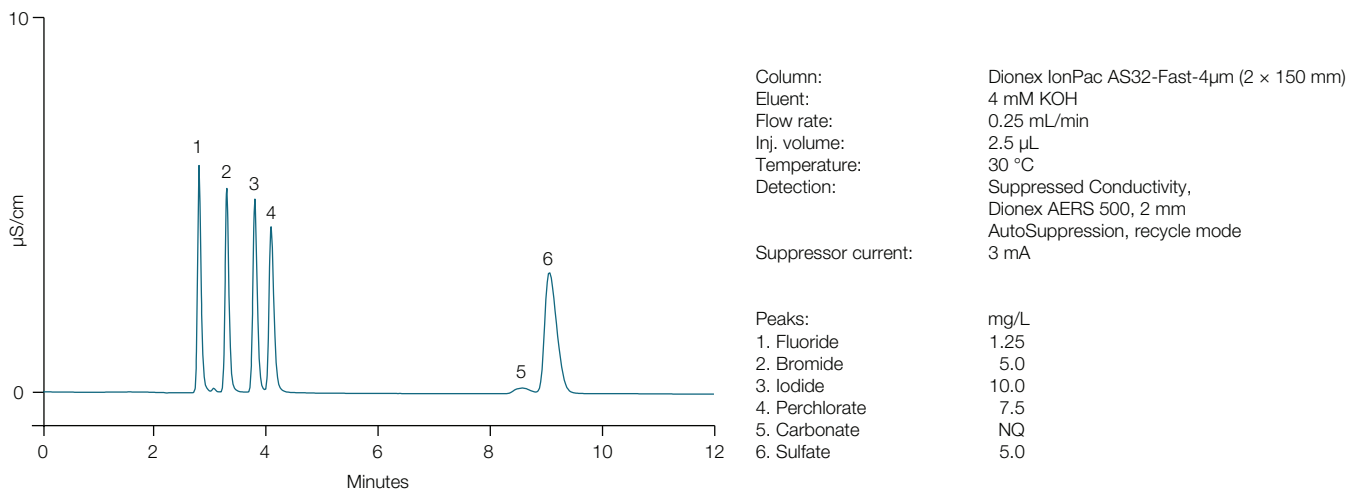


Figure 3. Perchlorate elutes well before sulfate on a Dionex IonPac AS32-Fast-4 μ m column.

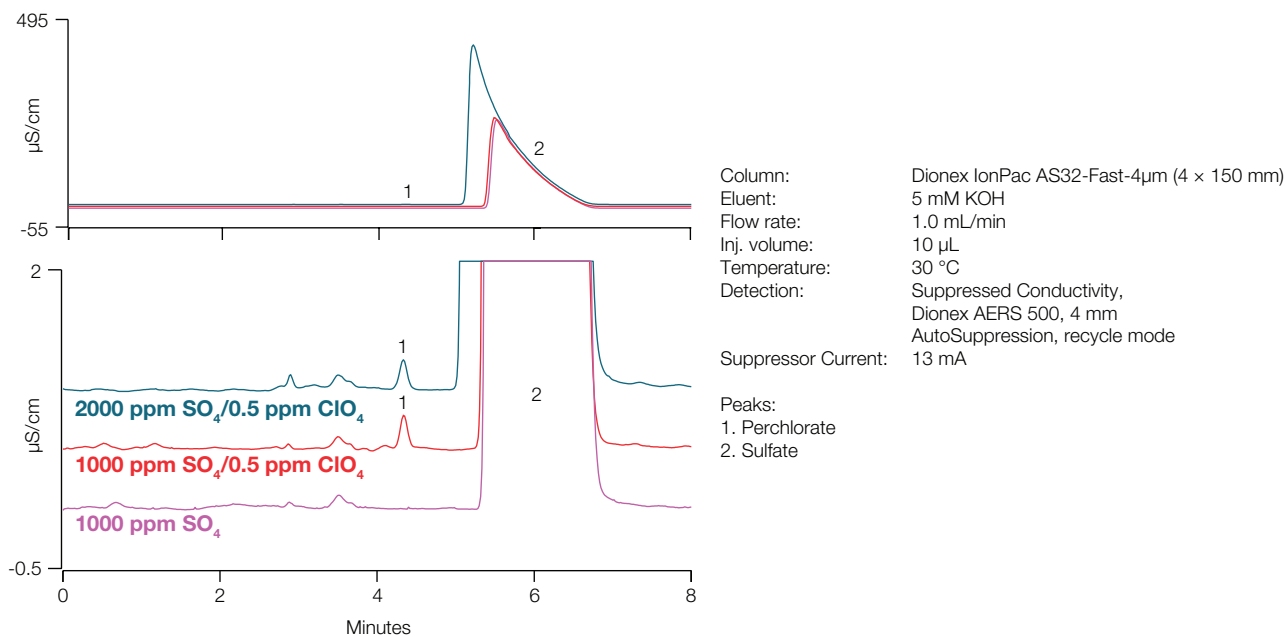


Figure 4. Isocratic separation of perchlorate in a high sulfate matrix on a 4 \times 150 mm Dionex IonPac AS32-Fast-4 μ m column.

Resolve aromatic sulfonates, pigments, and dyes

Color additives are often added to foods, pharmaceuticals, and cosmetics to enhance sensory perception. The precursors for many of these dyes and pigments are naphthalenesulfonic acids, which are also

used to make dispersants that aid in the manufacture of concrete, drywall, rubber, leather, and pesticides. As shown in Figure 5, the Dionex IonPac AS32-Fast-4 μ m column can separate these non-polar anions using a hydroxide gradient.

Column:	Dionex IonPac AG32-Fast-4 μ m (4 \times 30 mm)/ Dionex IonPac AS32-Fast-4 μ m (4 \times 150 mm)	Peaks:	mg/L
Eluent:	4 mM KOH from 0 to 4 min, 4–40 mM KOH from 4 to 10 min, 40–80 mM KOH from 10 to 14 min, 80 mM KOH from 14 to 20 min	1. p-Toluenesulfonic acid	25
Flow rate:	1.0 mL/min	2. 2-Naphthalenesulfonic acid	25
Inj. volume:	10 μ L	3. 4-Sulfobenzoic acid	25
Temperature:	30 $^{\circ}$ C	4. 1-Naphthol-4-sulfonic acid	25
Detection:	Suppressed Conductivity, Dionex AERS 500, 4 mm AutoSuppression, recycle mode	5. Naphthalene-disulfonic acid	25
Suppressor current:	198 mA	6. Naphthalene-trisulfonic acid	25
		7. FDC Yellow #5	25
		8. FDC Yellow #6	25
		9. FDC Red #40	25

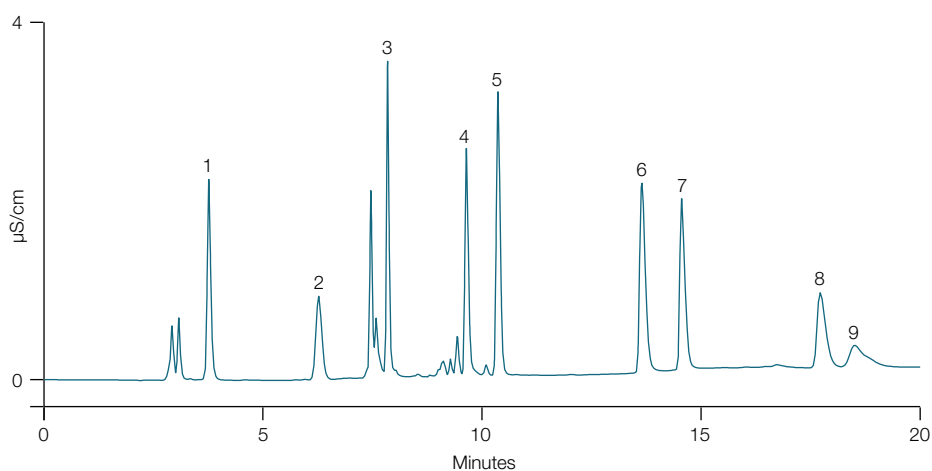
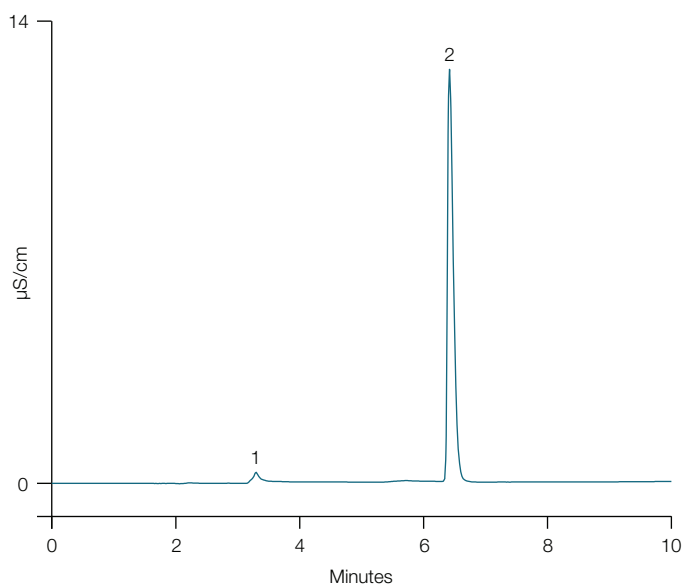


Figure 5. Separation of aromatic sulfonates, pigments, and dyes on a 4 \times 150 mm Dionex IonPac AS32-Fast-4 μ m column set.

Fast analysis of persulfate

Persulfate is found in bleaching solutions for cosmetics, photography, and textiles. An economical and highly stable oxidizer, persulfate is also used in electronics industry processes including plating, micro-etching, and

surface cleaning. Persulfate is also used as an initiator for plastic, rubber, and concrete manufacturing, and as a dispersant in ink and toner formulations. The Dionex IonPac AS32-Fast-4 μ m column can separate persulfate using a hydroxide gradient (Figure 6).



Column:	Dionex IonPac AG32-Fast-4 μ m (2 \times 30 mm)/ Dionex IonPac AS32-Fast-4 μ m (2 \times 150 mm)
Eluent:	10 mM KOH from 0 to 3 min, 10–30 mM KOH from 3 to 5 min, 30 mM KOH from 5 to 10 min
Flow rate:	0.25 mL/min
Inj. volume:	2.5 μ L
Temperature:	30 $^{\circ}$ C
Detection:	Suppressed Conductivity, Dionex AERS 500, 2 mm AutoSuppression, recycle mode
Suppressor current:	19 mA
Peaks:	mg/L
1. Sulfate	NQ
2. Persulfate	25

Figure 6. Determination of persulfate on a 2 \times 150 mm Dionex IonPac AS32-Fast-4 μ m column set.

System requirements

The Dionex IonPac AS32-Fast-4 μ m column is recommended for use with Thermo Scientific™ Dionex™ Integriion™ or ICS-6000 HPIC™ systems equipped with an eluent generator. These HPIC systems can operate continuously at up to 5000 psi to support the backpressure generated by the Dionex IonPac AS32-Fast-4 μ m column under standard operating

conditions. The eluent generator produces potassium hydroxide eluent from deionized water. For all systems, the use of Thermo Scientific™ Dionex™ IC PEEK Viper™ fittings (Figure 7) is recommended to achieve consistent low dead volume connections and ensure optimum chromatographic performance.



Figure 7. For best chromatographic performance, Dionex IC PEEK Viper fittings and sample loops are recommended for use with Dionex IonPac AS32-Fast-4 μ m columns.

Suppressor recommendations

For optimum ease of use and performance, Dionex IonPac AS32-Fast-4 μ m columns should be used with Dionex ADRS 600 Anion Dynamically Regenerated Suppressors. Alternatively, a Dionex AERS 500e Anion Electrolytically Regenerated Suppressor for External Water Mode may also be used with the Dionex IonPac AS32-Fast-4 μ m column.

Specifications

Dimensions:	Dionex IonPac AS32-Fast-4 μ m Analytical Columns: 2 \times 150 mm, 4 \times 150 mm Dionex IonPac AG32-Fast-4 μ m Guard Columns: 2 \times 30 mm, 4 \times 30 mm
Maximum operating pressure:	5000 psi
Mobile phase compatibility:	pH 0–14, 100% HPLC solvents (e.g., acetonitrile)
Substrate characteristics	
Analytical and guard columns:	Supermacroporous resin Particle Diameter: 4 μ m Pore Size: 2000 Å Crosslinking (%DVB): 55%
Functional group:	Alkanol quaternary ammonium
Hydrophobicity:	Ultralow
Capacity:	126 μ eq (4 \times 150 mm column) 31.5 μ eq (2 \times 150 mm column) 25 μ eq (4 \times 30 mm column) 8 μ eq (2 \times 30 mm column)
Column construction:	PEEK™ with 10–32 threaded ferrule-style end fittings. All components are nonmetallic.

Ordering information

To order in the US, visit thermofisher.com, call (800) 532-4752, or contact the nearest Thermo Fisher Scientific office. Outside the US, 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 AS32-Fast-4 μ m Analytical Column (4 \times 150 mm)	303151
Dionex IonPac AG32-Fast-4 μ m Guard Column (4 \times 30 mm)	303152
Dionex IonPac AS32-Fast-4 μ m Analytical Column (2 \times 150 mm)	303153
Dionex IonPac AG32-Fast-4 μ m Guard Column (2 \times 30 mm)	303154

Eluent generator accessories

Dionex EGC 500 KOH Eluent Generator Cartridge	075778
Dionex CR-ATC 600 Continuously Regenerated Anion Trap Column (for use with Dionex Integrion and ICS-6000 HPIC systems)	088662
Dionex CR-ATC 500 Continuously Regenerated Anion Trap Column (for use with Dionex ICS-5000+ HPIC systems)	075550

Dionex IC PEEK Viper fittings kits and sample loops

Dionex IC PEEK Viper Fittings Kit for Dionex ICS-6000 and ICS-5000+ systems with conductivity detectors	088803
Dionex IC PEEK Viper Fittings Kit for Dionex Integrion RFIC systems with conductivity detectors	088798
Dionex IC PEEK Viper Sample Loop, 2.5 μ L	302899
Dionex IC PEEK Viper Sample Loop, 5 μ L	302897
Dionex IC PEEK Viper Sample Loop, 10 μ L	302895
Dionex IC PEEK Viper Sample Loop, 25 μ L	302893

Suppressors

Dionex ADRS 600 (4 mm) Anion Dynamically Regenerated Suppressor	088666
Dionex ADRS 600 (2 mm) Anion Dynamically Regenerated Suppressor	088667
Dionex AERS 500e (4 mm) Anion Electrolytically Regenerated Suppressor for External Water Mode	302661
Dionex AERS 500e (2 mm) Anion Electrolytically Regenerated Suppressor for External Water Mode	302662

Find out more at thermofisher.com/ICCOLUMNS

ThermoFisher
SCIENTIFIC